SCIENTIFIC AMERICAN

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NOVEL TYPE OF HIGH SPAN BRIDGE.

Owing to the enormous expense of acquiring real estate for the construction of the approaches and termini of bridges in populous districts, a most interesting engineering problem is presented in the designing of bridges in which this difficulty is to be avoided. The bridge illustrated in the accompanying engraving is of this type, the shores being little above the water level, the stream being a navigable one, and the necessary condition being that the span should be sufficient to allow several ships to pass under simultaneously, and of sufficient height to permit vessels of ordinary size to pass under without the necessity of opening the draw. This bridge was intended to be erected across a wide canal running through Amsterdam, Holland, and engravings were prepared from the original designs of Mr. E. Haverkamp, C.E. The conditions which governed the building of a bridge of this description were as follows:

The city of Amsterdam, Holland, is built in the form of a half circle, the center of which is situated near the central railway depot, its diameter being the North Sea canal. The population of this city, now about 400,000 souls, is continually increasing and consequently also its number of houses and streets. Some of the latter ones are already extending the boundaries of the city, which makes it desirable that new buildings should be erected on the other side of the canal, where the lots form a direct part of the township of Amsterdam.

But the citizens object to build on that part of the canal, on account of its limited means of communication with the city itself. The people, in starting from that part, are compelled to make use of a ferryboat, on the De Ruyterkade; and although other cities intend to build tramways, northward of Amsterdam, to connect with that city by cars propelled by steam, it is beyond question that even then it will take much longer time to cross the canal than by means of a bridge.

This lack of accommodation gave Mr. Gerard W. Schimmel, a learned jurist of that city, and a gentleman of superior intellectual faculties, the impulse to submit to his countrymen a plan of a construction of a bridge crossing the canal, which was formerly called "Y." It is true similar plans have been projected before by others, but none was found practicable, on account of the enormous expenses connected with their erection and the difficulties they would cause to the navigation of vessels, so that these projects were never considered by the authorities of the city of Amsterdam.

Mr. Schimmel, however, has in his plan, which was calculated and drawn by Mr. Haverkamp, provided for these defects, and proved that by following his mode of construction, the city will be able to obtain a bridge of a height amply allowing steamers and vessels of small dimensions to pass under it and only to open this bridge for the passage of larger steamships.

On a first view of Mr. Schimmel's project, it would be supposed that in order to obtain this result, it would be well to provide the bridge with entrances equal to those of the Brooklyn bridge, but that would be impossible by the lack of sufficient space at the aforesaid De Ruyterkade. Therefore Mr. Schimmel in planning his project was compelled to follow another system.

The bridge is projected for the use of carriages, street cars, and passengers. The width of the road, not including the tramway, is 32′ 6″. That seems to be too much, but now we have the great advantage that near the foot of the tower there is no width less than 19′ 8″, so that two carriages can pass each other without touching the rails. The gauge of the tracks is 4′ 7⅞″, and equal to that of the Amsterdam street car company. The tracks on the swing bridge are traced symmetrical with respect to its axis, so that the bridge can always be turned in the same direction.

DIMENSIONS OF THE ROADS.

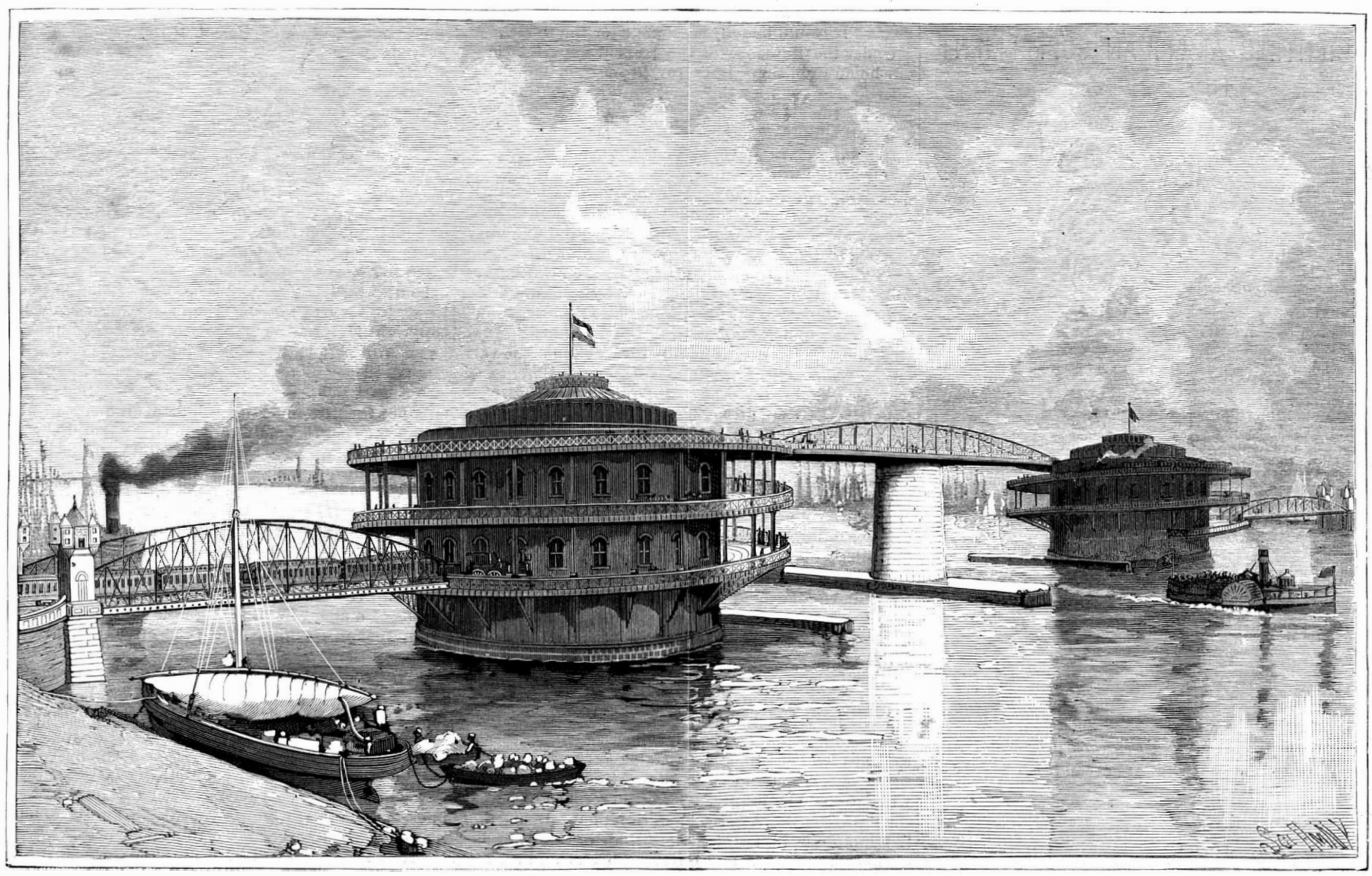
Part of the bridge.	Sidewalks.		Road.	Tramcar.	Total.
	Number.	Width.			
Approach	2	8′ 1″	32′ 6″	16′ 3″	64′ 11″
Gallery	1	8′ 1″	19′ 8″	16′ 3″	52′ 1″
Swing bridge	2	8′ 1″	19′ 8″	16′ 3″	44″

Both approaches have a length of 196′ 8″ between the centers of bearing, with a grade of 1:40. The distance between the lower part of the main girder and the water surface is, on an average, 13′. Near the towers they are supported by means of consoles, going through the center of the tower, having a length of 177′, and near the wall of the tower a height of 14′ 7½″. Those consoles are supposed to be constructed of wrought iron tubes, three for each console, strongly connected with each other. The clear opening of the turn bridge is 91′. This is sufficient, because the new lock at Yminden, the sea end of the canal, will get a width of 81′ 3″. The bridge is supposed to be opened with hydraulic machines, placed in the center pier. The distance between the lower part of the main girder of the swing bridge and the water surface is 48′ 9″. The towers have an outward diameter of 143′, and are constructed of stone. In the walls are windows to lighten the interior. The inner part can be used for making offices, lifts, and, when necessary, a footpath with a grade of 1 : 50. After having turned once round the tower, we have mounted 13′ 9″. This number could be easily increased, without changing the grade, but then the diameter of the tower would grow too large and the latter take too much space in the canal. As a matter of fact, the grade of the floor round the tower is not everywhere the same, as is shown below:

Part of the way round the tower.	Traffic.	
	Up.	Down.
Street car	1 : 38·2	1 : 34·4
Roadway	1 : 46·6	1 : 42·1
Sidewalk	1 : 53·3	1 : 53·3

The upper part of the tower is covered with a roof, under which are the entrance to the lift, the waiting rooms, and the other accessories.

THE oldest arm chair in the world is the throne of Queen Hatafu, who flourished in Egypt 1,600 years B.C. It is of ebony, beautifully carved. It is now one of the treasures of the British Museum.



NOVEL METHOD OF CONSTRUCTING A HIGH SPAN BRIDGE WITH LOW TERMINI.

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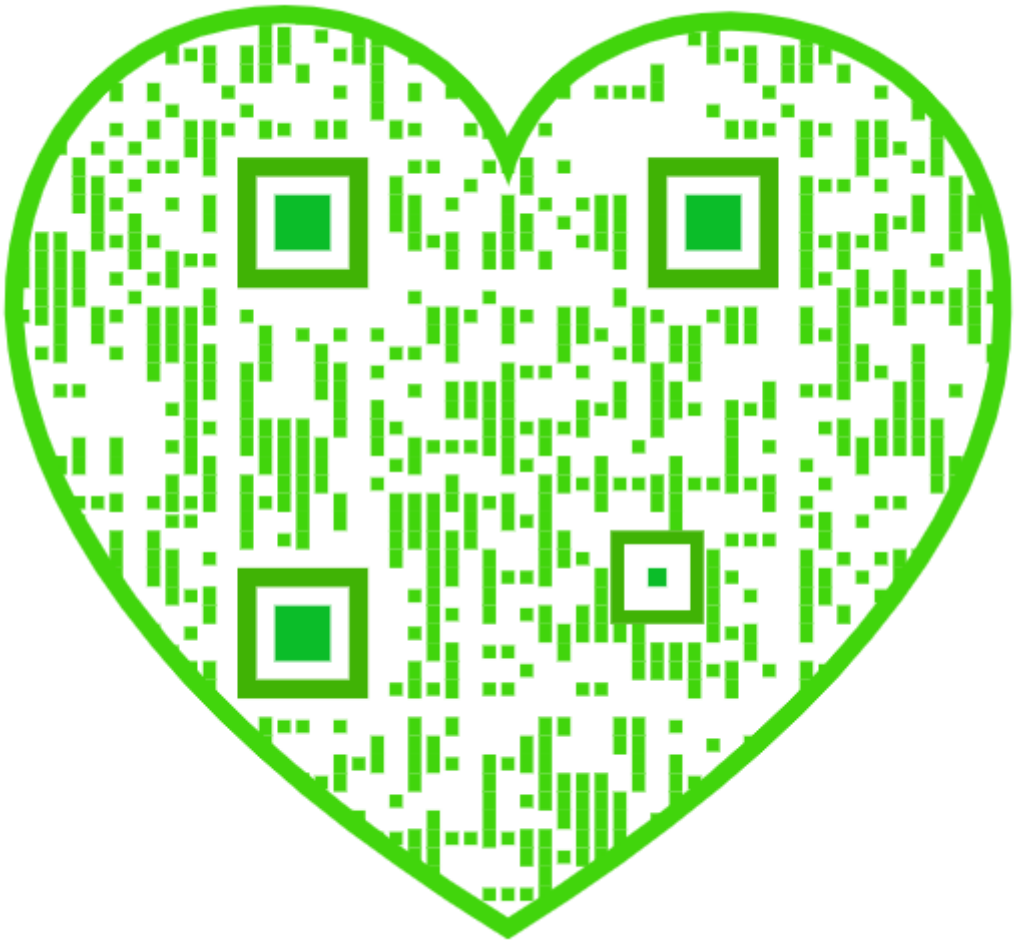

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THE NEW COPYRIGHT BILL NOW BEFORE CONGRESS.

A bill is now before Congress, and has been passed by the Senate, having for its ostensible motive the grant of copyright protection to foreign authors; but it is well understood the real object of the bill is to bring about, by aid of Congress, a sort of book trust, by which the prices of books will be advanced throughout the country, the rich publishers made richer and the printers of cheap literature driven out of business. Under the law as it stands, only American books can be patented; all others are free, and there is no mode by which the people can be deprived of cheap books, or those who make them deprived of occupation. But if this foreign copyright bill passes, all books can be patented, the rich publishers will purchase the patents and put up the prices, and only those who control the patents can continue in business.

Probably there are few who will dispute the propriety of granting copyright patents, in some form, for a limited period, to foreign authors; but in doing so every care should be taken to preserve existing advantages and to prevent injury to established industries. The Senate bill appears to be lacking in these respects, and is open to other objections.

The bill in substance provides that on and after July 1, 1888, copyright patents shall be granted to foreigners; they may hold these monopolies for forty-two years; the assigns of foreigners may also obtain copyrights; all postmasters and customs officers throughout the United States are constituted pimps and ferrets for these foreigners; it is made the duty of postmasters to spy out and seize all books going through the mails that infringe the copyrights of foreigners; if an American citizen coming home from abroad brings with him a purchased book, it is to be seized on landing unless he can produce the written consent of the man who owns the copyright, signed by two witnesses. Who the said owner may be, in what part of the world he lives, the innocent citizen must find out as best he can, or be despoiled of his property,

These are some of the strange provisions of the Senate bill, which, it is obvious, needs amendment.

Again, the period allowed for these foreign monopolies, namely, forty-two years, is altogether too long. The ordinary patent for an industral improvement, such as the sewing machine, the planing machine, the telegraph, the telephone, or any other invention, however wonderful or vast its benefits to the people, is only granted for seventeen years. The patent than expires, the monopoly ceases, and the people are at liberty freely to copy and duplicate the invention.

It would be much more satisfactory to the public if the term of the foreign copyright were reduced to five or ten years; and we trust an amendment to this effect will prevail when the bill comes before the House.

In considering the question of changing the statute, we ought not to overlook the benefits that have accrued to the country from the law as it now stands, and which has worked satisfactorily for more than fifty years. It would be folly to change for the worse.

Under the influence of the present copyright laws, our home publishers have for years been enabled to fill the country with the choicest books and periodicals at the lowest prices. The educative effects of this vast supply of standard literary matter have been astonishing. We have become the greatest reading people in the world.

Says Mr. Andrew Carnegie in his "Triumphant Democracy": "It is estimated there are twenty-three thousand school libraries in America, containing forty-five million books—*twelve million more than all the public libraries of Europe combined.* Other educational establishments increase this number by two and a half million volumes, and thirty-eight State libraries contribute over a million more. The Congressional library, the Astor, the Boston city, the Philadelphia, the various mercantile libraries, the Watkinson reference at Hartford, and many others will raise the grand total to much more than fifty million volumes—a book almost for every man, woman, and child in the United States. More than three hundred libraries contain ten thousand volumes each, twelve contain more than a hundred thousand volumes each, and two contain four hundred thousand volumes each. Even this statement but feebly shadows forth the truth as to the books and periodicals of the country, as compared with those of other lands, for the American is not only a reader, but he is above all other men a buyer of books. Circulating libraries are not so generally used as in Europe. It is when you enter the home of the American farmer or artisan that you are struck with the number of books and magazines you see—the two or three shelves and often far greater number filled with them.

"The universal propensity of the American, young and old, for reading and writing has sometimes seemed to me to lend countenance to Dogberry's dictum that while a good name was the gift of God, 'reading and writing came by nature.' These do seem to be part of the nature of the American. Triumphant Democracy is triumphant in nothing more than in this, that her members are readers and buyers of books and reading matter beyond the members of any government of a class, but in this particular each system is only seen to be true to its nature. The monarchist boasts more bayonets, the republican more books."

It is not unreasonable to assume that the greatest impulses toward the attainment of our present position in respect to popular education, intelligence, and native authorship have been derived, directly or indirectly, from the existing copyright law, which excludes foreigners and encourages American citizens. Independently of these advantages, the law has helped to develop some of the largest industries. It has created enormous establishments for the manufacture of paper, chemicals, types, printing presses, and engines. It has called to employment multitudes of operatives. It gives volume to the mails, helping to freight and support the railways, steamers, telegraphs, and other adjuncts of civilization.

Upon the American author the copyright law, as it stands, confers important benefits. It secures to him the exclusive right to his writings for forty-two years. No citizen who can produce anything worth reading lacks for employment or emolument. It is agreed on all sides that no country was ever blessed with so many able authors as the United States. They ought to be well rewarded, and under the law as it stands they are. It would be easy to give many examples; a few must suffice. Of "Uncle Tom's Cabin," by Mrs. Stowe, some two millions of copies have been sold; of "Ben Hur," by General Wallace, 250,000 copies; of Roe's works, hundreds of thousands of copies. Some of the story papers, filled with copyrighted tales, sell four hundred thousand copies of each issue, aggregating many millions per year. Mark Twain is said to have made five hundred thousand dollars clear profit within five years from his copyright patents. He receives a handsome royalty on every volume sold. Mr. Blaine has derived a great fortune in the same manner. Mrs. Grant is reported to have received three-quarters of a million dollars as her share of proceeds from the sale of the great General's book, and the copyright patent has forty years still to run.

The money paid to American authors remains within the country. The extension of copyright monopoly to foreigners will enable them to draw millions out of the country.

To this it may properly be answered, if we grant copyright to foreigners, then foreign nations will in duty be bound to allow similar rights to Americans; and so the money will come back. But we fear there is little equality in the matter. American readers and book buyers are as five to one, the world over. The financial result of the patent copyright extension would be, in the same ratio, adverse to the United States.

PASSAGE OF THE COPYRIGHT BILL IN THE SENATE.

The copyright bill, to which allusion is made in the preceding article, appears to have received less attention and less discussion in the Senate than its important nature demanded. Only three or four Senators spoke upon the merits of the subject, and their remarks were quite brief. We fear the votes of the majority by which the bill was passed were cast without a full appreciation of the real crudity of the enactment. Among the ablest of the speeches made was that of Senator Zebulon B. Vance, of North Carolina, from which we make the following abstracts:

"Mr. President, the proposed measure of copyright is intended to create a monopoly and enhance the price of the product, making literature and knowledge dear to the people. Almost all nations, I believe, grant a national copyright on the supposition that the disadvantage of monopoly, bad as it is, would be compensated to some extent by the benefit arising from the encouragement of literature and the stimulation of those who write for the people. An international copyright is simply a monopoly. It is a monopoly between America and the chief nations of civilization and the principal authors and sources of knowledge, and as such it becomes doubly objectionable. It will enhance the price of knowledge to all people in this country, as it will to all people in Great Britain.'

"Of course we have the ancient and venerable chestnut brought up, which is always made to do duty in behalf of any proposition to put money into individuals' pockets, that this copyright law would operate to cheapen literature. Life is too short to waste time in arguing that as an abstract proposition. If it did not increase the price of literature, there would be no demand for it here. It could not possibly stimulate the genius of a man to write and publish books and matter in magazines unless the price of that matter was increased to him."

"The whole scheme is evidently one whose basis is what is known as protection, or taxing the people to make a few persons rich. That is the object of the whole thing, and that underlies it. It is an effort to extend monopoly extra-territorially, beyond the jurisdiction of the laws of our country, by a grand international conspiracy between publishers, printers, and book-makers everywhere in the civilized world to make literature and knowledge for the people dear.'

"It is not worth while for any Senator, as I have known some to do in the course of this debate, to go off into grand heroic and literary eloquence about the

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glories and blessings of literature and the importance of encouraging that divine afflatus which we call genius, for the benefit of mankind, etc., for no odds how high they soar they become much like Mr. Boffin's secretary with the wooden leg, who professionally 'rose and fell,' and as a friend 'dropped into poetry.'

"However high they soar in the grand heroics of literary eloquence, professionally, as thrifty protectionists, they drop into filthy lucre. That is at the bottom of it as sure as we live, and in opposing the extension of this interdiction on the acquisition of knowledge by the common people by means of the newspapers, the periodicals, and the magazines of the day, I claim to be a better friend to the grand things which emanate from the human mind and a greater admirer of them than those who undertake to make money out of them by placing them out of the reach of the poor."

"It seems to me that there can be no excuse for carrying this restriction upon human knowledge so far as this bill would carry it. It seems to me that there is no reason assignable why the source of all our knowledge, why the very fountain of all our civilization and advancement, should be made more costly and more inaccessible to the great mass of our people."

"It was but a few short and momentous weeks since that this Senate, with my help, under the lead of the gallant and philanthropic and benevolent Senator from New Hampshire [Mr. Blair], passed a bill appropriating $78,000,000 to educate the poor and ignorant children of this country and teach them how to read; and now this same Senate, under the lead of the same benevolent Senator, has just passed a bill increasing the price of books to those poor people and placing reading matter out of their reach. And so we go: a bundle of contradictions, with nothing but the natural and inherent and instinctive greatness of our people and of our country to prevent us from becoming supremely ridiculous in the eyes of the civilized world—and that remark is not copyrighted."

Senator Teller said: "I believe it [the bill] will have a tendency, not injurious to American literature particularly, but to increase the price of all literature in this country; and not believing there is any commensurate benefit for the injury the reading public will receive, I am opposed to the bill. I am in favor of limiting it to a short time, if it is to become a law, until we can see what its practical effect will be."

Senators Saulsbury and George spoke briefly to the same purport. The bill passed, 10 to 34. Absent, 32.

CITY FLOWERS.

The native of Central or South America who shall visit New York this summer may well pause in surprise as he comes up through the Bowling Green and looks into the little triangular park audaciously obtruding itself into this region of mercantile bustle and hurry. There, in the miniature pond, amid other aquatic plants of lesser dignity and importance, he will see the noble water lily, *Victoria regia*, its great leaves—sometimes they are as much as six feet across—floating in Croton water with as much thrift as in the waters of the Parana and Paraguay, and should he come at the right time, he may even see the beautiful blossom of white and pink. Indeed, it will likely enough be quite as much of a surprise to the merchants and factors thereabout, coming down to their offices some summer day, to discover that exotic fragrance has mastered the familiar odors of petroleum and pitch and ships' furnishings, for Superintendent Woolson, of the Central Park, says the perfume of this water lily is so strong that it will be perceptible two blocks distant. By means of a pipe under water and circling the pond, the water will be warmed, a thermostat enabling an attendant to keep its temperature between 70° and 80° F.

The beautiful moss pink is now a-bloom on the rocks of the Central Park, and in some places you can scarcely see its foliage because of the mass of flowerets. This is noticeably so at 79th Street, on the east drive; at Mount St. Vincent; at 110th Street and 7th Avenue.

The tulips, white, golden, yellow, and bright red, are in full bloom. There is a fine bed of them at the Fifth Avenue entrance, thousands of them in the beds about the Arsenal and Mount St. Vincent. Here also the rock cress, in full bloom, is busy decorating the rocks with white flowerets; their tiny heads following the sun from east to west, as if they feared to lose him. The English heather by the Ramble and the Bridle Path, on the west side, near 81st Street, is covered with its bell-shaped flowers of pink. Near the greenhouses the beautiful narcissus is in bloom; the double yellow and white ("Von Sion") and the small yellow trumpet variety. Then there is the grape hyacinth in blue, with its bell-shaped or globular flowers, not like the ordinary hyacinths, which are open and reflexed; the *Urularia grandiflora*, large, yellow, and drooping. In the middle of the little garden at the northern end of the propagating beds, a shrub magnolia, about three feet high, is covered with milk-white flowers, and near by is the *Magnolia Linnei*, with bright red flowers, while by the Ramble *Magnolia conspicua* and the *Magnolia soulangeria* are also in bloom, the flowers of the first named being white and of the other pink and white.

The roses are budding, and soon the marigolds will be a bloom, opening with clock-like regularity at nine o'clock in the morning and closing their petals when the big clock in the Arsenal tower strikes three. The beautiful amaryllis will reflect the bright crimson of the opening day, the sparkling dew in its stigma catching the ruby color of its petals and losing it again as it falls into the waiting tube, till, the sun hanging its red coat in the sky and going down below to rest, the sparkling waters are thrust up again into the stigma.

Ludwig Nobel.

The engineering profession has suffered a severe loss in the death of Mr. Ludwig Nobel, at Cannes. The son of a Swedish engineer, who invented and placed in the channels of Cronstadt the "infernal machines" which annoyed Sir Charles Napier so much, he received a practical training as engineer, and notwithstanding a temporary check experienced by the failure of his father, he managed by hard work and economy to recover in time the iron works his father had lost, and extended them to their present proportions at St. Petersburg. But it was less in his own profession than outside it that he was destined to achieve distinction, although it was his engineering capacity that equipped him for the revolution he accomplished in the oil trade. In this respect his career was a striking illustration of the influence a modern engineer can exercise upon a purely commercial pursuit. Quite by chance, in 1876, he was led by his brother, whom he had sent to the Caucasus in search of walnut wood for the stocks of the Berdan rifles he was manufacturing for the government, to invest a few thousands in a small Baku oil refinery. This failing to yield much profit, owing to the difficulties of transport, Mr. Ludwig Nobel applied himself seriously to solve some of them, and by degrees was drawn completely into the petroleum business. The innovations he introduced, in the shape of pipe lines, tank steamers, and tank cars for railways, not only in a few short years revolutionized the oil trade of Russia, but that of the whole of Europe; the elaborate system of transport in bulk he established, coupled with the copious supply of cheap oil, enabling Russian petroleum to penetrate to every town on the Continent, and even flood the more distant market of India. The enormous magnitude to which his undertaking rapidly expanded, until the few thousands he embarked in the business developed to a capital of three millions sterling, was told in these columns three years ago by Mr. Charles Marvin, whose "Petroleum Industry of Russia" contained in all engineering essentials the story of the Baku oil king's extraordinary career.

To-day the Nobel firm owns the largest oil refinery in the world, the largest fleet of tank steamers, thousands of oil trucks, and depots holding tens of millions of gallons of oil. That so much should have been achieved in a little more than ten years is a remarkable testimony to the power of organization Ludwig Nobel possessed to an eminent degree, while the wealth he amassed in a pursuit wherein merchants had either failed or made but a miserable income shows what may be achieved by the enterprising and skilled engineer in departments of trade conventionally supposed to belong to merchants only.—*Engineering.*

Dr. Emil Bessels.

At Charfreitag, Stuttgardt, recently, this well known physician, naturalist, and Arctic explorer succumbed to heart failure, at the early age of forty.

Dr. Emil Bessels was born in 1847, at Heidelberg, and studied medicine and natural history first at the University of Jena and finally at that of his native city. At the instance of Petermann, the geographer, he embarked on his first expedition to the North Pole on board the steamship Albert in 1869, the purpose of the voyage being to explore the eastern frozen sea between Spitzbergen and Nova Zembla and to investigate Gillis Land. Only the first part of this project could be carried out, as the state of the ice made disembarkation on Gillis Land impossible; but the work effected was important. Hydrographic observations were made and a complete series of deep-sea soundings were taken, and for the first time the existence of the Gulf Stream east of Spitzbergen was demonstrated.

In 1871 Dr. Bessels was summoned to the United States to undertake the scientific direction of the North Pole expedition under Ch. Francis Hall. In pursuance of his researches he penetrated into the northern prolongation of Smith's Sound, and reached the 82° 26′ of north latitude—a feat performed by no previous voyager. Unfortunately, the ship—the Polaris—foundered, carrying all his scientific treasure trove to the bottom. From the direction of the wave current and from the pieces of walnut wood borne upon it, he concluded that there was a northern connection of this arm of the sea with Behring's Straits. Besides his contributions to German journals and to the bulletins of the United States geological and geographical survey, Dr. Bessels wrote the first part ("Physical Observations") of the narrative of the voyage of the Polaris, a work in three volumes, entitled "Scientific Results of the United States Arctic Expedition" (Washington, 1876), also published in German (Leipzig, 1878). After this he settled at Washington as secretary to the Smithsonian Institution, where a long and useful career seemed in store for him, when, on Christmas eve, 1885—a night of extraordinary cold—his house took fire, and the flames spread so rapidly that he had barely time to escape by letting himself down from the first floor in his nightshirt by means of a linen table cloth. He then caught a chill, from which he never quite recovered. This, and his grief at the loss of his precious library and scientific treasures, made a changed man of him. He came to Stuttgardt—a place which had great attractions for him as the scene of early studies in the Royal Natural History Museum—and there for two years he worked at his favorite pursuits, and also at literature, till he had to take to bed, from which he never rose. He was found dead, having apparently passed away as suddenly as painlessly, leaving a blank in the medical and scientific circles of the Wurtemberg capital which will not soon be filled.—*Lancet.*

Michael Heilprin.

Michael Heilprin, well known as one of the principal editors of Appleton's Encyclopedia, died at his home in Summit, N. J., on May 10. He was born in Poland, in 1823, and was identified with Kossuth's movement for the freedom of Hungary, whither he had gone early in life. He came to this country in 1856. His work here was principally literary. In the case of the Encyclopedia, he was intrusted with the supervision of all the matter contributed. He was one of the early contributors to the New York *Nation*, and never severed his connection with it. He was one of its most voluminous contributors. He leaves two sons, Louis Heilprin, well known as a writer on chronology and history, and Angelo Heilprin, the well known geologist, whose works have been reviewed in these columns.

Damp Cellars.

The most prominent causes of damp cellars are:

1. Dampness permeating the walls.
2. Dampness from saturated soil appearing below the walls.
3. Dampness from imperfect plumbing.
4. Moist ground air permeating cellar bottom, forced in by air pressure.

The first is an evidence of either poor workmanship and material or imperfect drainage. Should it be the former, and discovered in time, a compulsory removal of the work is the best remedy. A good wall (stone is here understood) should have every space completely filled. Small, flat stones make the best work when carefully bonded and fitted. Look out for walls showing nothing but large flat stone on the outer faces, as such are often but dry concrete in the center. If the work has progressed too far to allow the wall to be taken down, the remedy is a thorough coating of cement on the outside—from grade to footing—backed by a careful drainage of the immediate vicinity. Great care is necessary to keep the surface water from the building on all sides. It will not suffice to keep it five, ten, or twenty feet away, and then allow it to pool, as the ground will absorb it, and if the strata should happen to incline in the direction of the cellar, conduct the moisture to the wall, where although perhaps not appearing in drops on the surface, still keeping the joints damp enough to affect the atmosphere and cause the mortar to decay.

Good, clean, yellow clay, well puddled and rammed around the walls, is an excellent protection, and one that should never be omitted.

Frequently, in neighborhoods thinly settled, where the sewage system is imperfect, or, rather, not completed, the ground becomes waterlogged, or so saturated with moisture as to cause any shallow excavation to collect water, and it will be noticed in such ground that after a rain all these depressions hold the water with great tenacity. In fact, the soil seems unable to absorb any more.

Cellars sunk in such ground will be damp at the foot of the wall, the moisture extending out on the cellar floor, while any small knoll, caused by uneven excavation, may be perfectly dry on top, and even, as has occurred in my practice, the clay opening in seams from contraction in drying, while but a few feet away the mud was three to six inches deep. This has been noticed even in a house situated on a small plateau with rapid drainage to all sides.—*Building Trades Journal.*

Garbage Burning.

A correspondent asks if some inexpensive plan be given for a practical family crematory for refuse vegetation, kitchen scraps, rubbish, etc., could not be constructed, into which refuse matter could be emptied as it accumulated, and thus have a way to prevent so much garbage lying in back alleys, slop barrels, etc., where it is allowed to decay, with so much bad effect to cleanliness, health, and comfort. Here is a chance for the ingenious to study.

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THE BRITISH AFRICAN EXPEDITION.

Major Festing, her Majesty's commissioner to Almami Samodu, on January 18 started from Freetown, Sierra Leone, on the expedition ordered by the imperial government, accompanied by a retinue of about one hundred persons. He would reach Rotombo, on the Sierra Leone River, the same evening, and would continue his journey by water to Port Loko, whence he would begin his long march into the interior, to the Sofa country, a land as yet unknown to the white man. The first important halt would be made at Bumban, distant about eighty miles from Port Loko, which is forty miles by water from Sierra Leone. Much confidence is felt in the success of this expedition, under so able and experienced an officer.

Almami Sanankoroh, otherwise called Almami Samodu, a powerful native ruler, is the son of Lamfia Ture, and was born in Sanankoroh, the capital of the Koniah district of West Africa, situated in a tract of country lying between latitude 9 degrees and 10 degrees N. and longitude 9 degrees and 10 degrees W. He is a Mandingo, and about forty years of age, and his family is superior to most of the families in his country. He visited Sierra Leone as a trader some years ago. Being of a studious and inquiring nature, he became a pupil of some of the learned priests of the Mohammedan religion in his native place, and afterward in Kankan, in the Bate district. Acquiring some knowledge of Arabic and of the Koran, he gathered around him many followers, and called on the pagans in his own conntry, and among the surrounding tribes, to renounce their ways and adopt his religion. He grew too powerful for the king, Almami Ibrahima Sisi, whom he defeated and took prisoner, deposed him, and reigned in his stead. Since 1878, King Samodu has made extensive conquests, and has enlarged his dominions on all sides, annexing the territories of Trong, to the west, Kolonkala or Kolakonta, to the north, Bate, Sankaran, Baleya, Madina, Bambara, Wassulu, Sulimah, and the remaining parts of Mandingoland, including Boure, a small province to the east, which is rich in gold. He has repeatedly been invited to lend his aid to one or another party in the civil wars of those provinces, which have usually ended in establishing his own sovereignty over them. His latest exploit, in 1885, was to march on Samayah, the capital of Tambaka, and to chastise the marauders who were frequently attacking and plundering traders on their way to the sea coast. It is evident that Samodu is apparenly a man of no common ability. Toward the colony of Sierra Leone he entertains peaceful intentions, for he is desirous of cementing his friendship with the English, and of opening up trade with his country.—*Illustrated London News.*

[NATURE.]

The Cultivation of Oysters.

A report from the British consul at Baltimore on the oyster fisheries of Maryland, which has just been laid before Parliament, contains much interesting information respecting the cultivation of oysters. The method of farming most successful in America consists in depositing clean oyster shells upon the bottom, just before the spawning season, to which the young attach themselves, and then placing among the shells a few mature oysters to furnish eggs and young. As soon as the young oysters caught in this manner are large enough to handle, they are distributed over the bottom.

Another system is by artificial propagation, properly so called—that is, by producing the seed oyster itself, or procuring it by methods less simple than the shell-sowing process. This method is due to a discovery by Dr. W. K. Brooks that the *Ostrea virginiana*, or American oyster, is not, like the *Ostrea edulis*, or oyster of Northern Europe, hermaphrodite, but is exclusively male or exclusively female. The eggs of the European oyster are fertilized within the valves of the parent, while in the case of the American oyster fertilization takes place in the broad and open waters.

By experiment Dr. Brooks discovered how artificial fertilization could be procured, and the next great step of finding a simple and practical method of rearing the young oysters which have been hatched artificially was the work of M. Bouchon Brandsle, the French naturalist, who experimented with Portuguese oysters, which, like the American variety, are of distinct sexes. He succeeded in rearing many seed oysters fit for planting.

Another highly important industry which is springing up in the United States, and which also owes its existence to a careful study of the habits of the bivalve, is that of "muzzling" oysters, by which they can be sent long distances in their shells with perfect safety. Until recently, the general practice was to pack the raw oysters in ice, but a sudden rise of temperature is liable to render a whole week's supply useless. Oysters feed twice a day, and always at the still moment preceding the turn of the tide, and at no other time, except when feeding, do they open their shells. When taken out of their natural element, they attempt to feed at regular intervals, and so soon as the shells open, the liquor they contain is all lost, the air takes its place, and the oyster is covered with a thick coating of slime, which is the first stage of decomposition. As long as the shells are closed, the oyster is fit to eat; it feeds on the liquor in the shell, and will thus keep in good condition for a considerable time. To secure the keeping of the shells closed, a method has been invented of tying them with stout wire, which can be done with great rapidity, and now arrangements are being made for dispatching American oysters in their natural condition all over the civilized world.

An Interesting Artesian Boring.

An artesian tube well, 1,106 feet deep, has recently been completed at Messrs. F. Everitt & Co.'s, near Birmingham, by Messrs. Le Grand & Sutcliff, of London. Hitherto very deep borings in search of water have not always resulted in attaining the end in view; but in the present instance, complete success has rewarded the enterprise and perseverance of Messrs. Everitt in prosecuting the costly work in the face of many adverse opinions as to the hopeless prospect of finding water, previous attempts to penetrate through the keuper marl formation in this district having failed. The depth of the keuper series had been variously estimated at from 400 to 500 feet thick; but according to Professor Lapworth, who has reported on this boring, after passing through 56 feet of drift, the marl and gypsum beds proved to be no less than 547 feet thick. The next 326 feet passed through the water stones or keuper sandstone series, which were found to be practically waterless—the remaining 177 feet penetrating into the upper variegated sandstone; and it is from the last 100 feet of these beds that an excellent supply of water of unusual purity has been obtained. An interesting operation, upon the completion of the boring, consisted of cutting off the innermost lining tube, 4 inches in diameter, at a depth of 427 feet below the surface. So effective was the appliance devised for this purpose, that the cutting tool was fixed, the pipe cut, and the tool taken out in the short space of two hours; and the end of the pipe, when withdrawn, presented a perfectly even appearance, as though it had been cut off in the lathe.

MODE OF TRAVELING IN SIERRA LEONE.

Therapeutical Value of the Passion Flower.

According to Dr. G. W. Winterburn, in *American Homœopath*, great virtues are attributed to this flower. He says the therapeutic uses of the white passion flower resemble the bromides on one hand and gelsemium on the other. It is one of our best hypnotics, producing a quiet, pleasant sleep—altogether different from the comatose stupor of morphia—from which the patient may be aroused at any moment. It may be given in doses of two or three drops of the tincture or low dilution. Even in the worst form of sleeplessness, that associated with suicidal mania, this drug will produce quiet sleep, from which the patient awakes with clear mind and rational thoughts. In its control of convulsions passiflora closely resembles gelsemium. It will be found of service in opisthotonos, trismus, and tetanus

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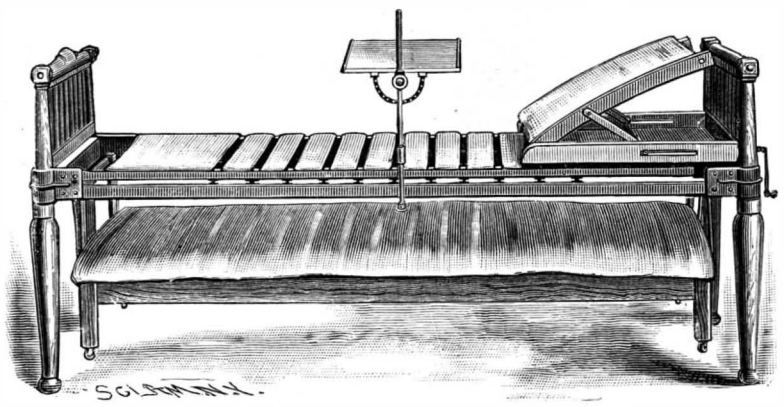
THE CROSBY INVALID BED.

In the care of the sick and injured there is nothing so much dreaded, both by nurses and doctors, as moving the patient when change of bedding or clothing is necessary.

The invalid bed which we illustrate in this connection was invented a number of years ago by Dr. Josiah Crosby, of Hanover, N. H., and is manufactured by the Invalid Furniture Co., of Nashua, N. H., which under the efficient management of G. W. Whittemore, who has remodeled the bed, retaining little more than the principle of Dr. Crosby's invention. As will be seen by the accompanying illustration, the mattress lies on a trundle bed, which is attached to the frame of the bed



THE CROSBY INVALID BED.

by lifting bands, which, by turning a crank at the head of the bed, enables the mattress to take the full weight of the patient, allowing the cross bands to lie loosely upon the mattress, so that the patient can have the entire elasticity of the bed.

The cross bands are adjusted by the pins through the loops in them so as to give equal pressure to all parts of the body when the mattress is lowered; and when it becomes necessary to take out one or more of the bands, or to take them up to ease the patient, it should be done while the mattress is up and the weight of the patient rests on the mattress.

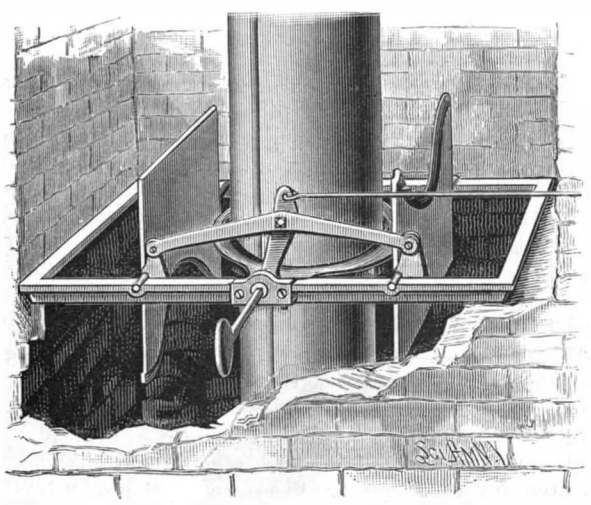
The adjustable head rest is also an important feature, as it enables the nurse to raise the patient to any position up to sitting posture without touching the patient, and the little table shown attached to the upright rod at the side of the bed can be adjusted to any height or angle desired, and form at will a small table or book rest.

One person is able to change the bedding without exertion or assistance. The trundle bed is smaller in every way than the frame of the bed, which permits it to be moved out under head, foot, or either side of the bed.

These beds are largely used, and the fact that among all the varieties offered this one was selected by President Garfield's physicians shows in what estimation it is held by the leading members of the medical profession.

AN IMPROVED HOT AIR REGISTER.

A device designed to be placed in the chimney, just above the fireplace heater, whereby the heat from the stove may be readily thrown out altogether into the room, or be partially conducted into an adjoining room or into chambers above, is illustrated herewith, and has been patented by Mr. William F. Rossman, of Hudson, N. Y. An open frame, of shape best designed for the flue, is placed above the heater, the frame having



ROSSMAN'S HOT AIR REGISTER.

a central integral ring, and valves being journaled in its upper face designed to completely close the opening between the sides of the frame and the ring. Integral with one side edge of each valve are lugs, to which an upwardly curved bar is pivotally attached, this curved bar being pivoted in a slot centrally of a rocking bar, the lower end of the rocking bar being made cylindrical, and having a square aperture, in which is a key for opening or closing the valves. In an aperture at the top of the rocking bar is a rod extending a convenient distance, affording facility for operating the valves without approaching the heater. The upper section of pipe is supported by a collar held in connection with the under side of the ring, so that the heater may be detached and replaced without disturbing the length of pipe passing up the flue, and the damper may be made either round or square, the construction affording a close and tight register, while providing a passage for the smoke pipe without interfering with the free operation of the valves.

Soap Bubbles.

At a recent meeting of the Physical Society, London, Mr. C. V. Boys described and performed some experiments on soap bubbles, and by their aid demonstrated in a remarkable manner the phenomena of surface tension, diffusion, and the magnetic properties of gases. By blowing one bubble inside another he showed that there is no electrical force inside a closed conductor. A peculiar property of soap bubbles is their refusal to come into contact when knocked against each other. They may receive violent shocks and still remain separate. If, however, an electrical body be brought in the vicinity, they immediately coalesce. So sensitive are they to electrical attraction, that a potential difference due to one Leclanche cell between the two bubbles causes them to unite. They may thus serve as a very delicate electroscope. Many other beautiful and extremely interesting experiments on liquid films of different shapes were performed in a masterly manner.

AN IMPROVED CLOTH CUTTER.

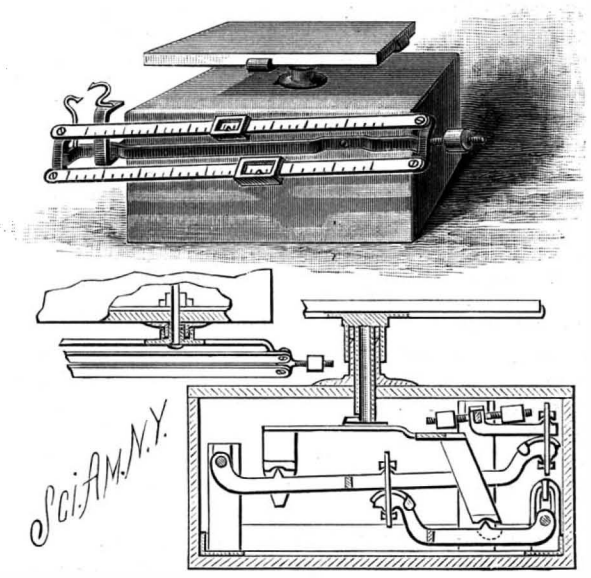
A simple and effective device for cutting cloth, in which the knife will always be in convenient position

RIES' CLOTH CUTTER.

for use, is illustrated herewith, and has been patented by Mr. George A. Ries, of Poplar Bluff, Mo. It consists of an arrow, slotted casing adapted to be secured to a counter or table, and having at one end a circular receptacle for holding a wheel or roller having a retracting spring, a cord being wound upon the wheel and secured to the ring of a knife holder extending diagonally through the slot. The knife holder has rubber rollers above and beneath the slot, and is formed with a ring at its outer end for the insertion of a finger. The piece of cloth to be cut being placed over the casing and held in position by pins projecting therefrom, the knife is drawn straight and square across, the rubber roller of the knife holder on the top of the slot pressing down the cloth firmly as it is cut, and both rollers serving as friction rollers, facilitating the quick and easy movement of the knife, as it is drawn forward by the operator or backward by the retracting spring.

AN IMPROVED COUNTER SCALE.

A scale which is provided with a secure housing of the levers, while allowing the free vertical movement of the scale plate, rendering it impossible for dust or moisture to enter the case in which the levers are disposed, has been patented by Mr. John B. Butenschon, of No. 72 Sheridan Street, Portland, Oregon, and is illustrated herewith. The scale frame, at one end, within the case, has vertical standards which support the cross shaft of a main lever formed with cross arms rigidly connected to the shaft, while at the other end of the frame are vertical standards from which is supported a shaft with rigidly secured secondary lever extending outward beneath the main lever, and provided with a knife edge bearing. In connection with these levers, and at equal distances from the cross shafts at either end of the frame, are formed knife edges upon which is placed a four-armed spider provided with an upwardly extending vertical standard which projects beyond the cover of the case. A sleeve surrounds the standard and extends downward from the plate frame, a second sleeve connected to the case cover extending upward about this sleeve, while a third sleeve extends downward from the plate frame about the second sleeve, perfectly protecting the mechanism of the scale. The main beam and the light weight beam are rigidly

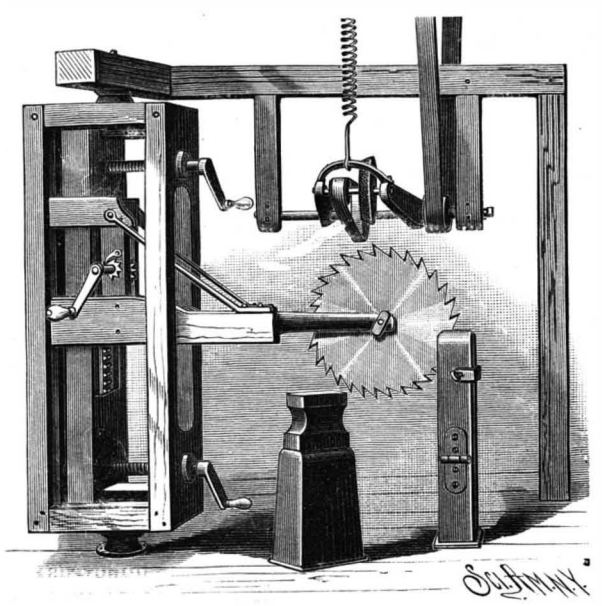


BUTENSCHON'S COUNTER SCALE.

connected to a third beam that is rigidly connected to a cross bar, formed with knife edges, the cross bar passing out of the case through a flanged opening and annular groove, to prevent the entrance of moisture and dust, and on its inner portion being connected through links and knife edges with the main and secondary levers of the mechanism. The beam carries a pointer in connection with an indicator, and a counterbalance weight for general adjustment of the scale, the original adjustment being obtained by weights within the casing.

AN IMPROVED CIRCULAR SAW HOLDER.

A device for holding circular saws firmly in position while hammering, gumming, swaging, and filing them is illustrated herewith, and has been patented by Mr. John Slater, of Parthenia, Pa. A frame is mounted to turn on spindles, the top one of which may have its bearing in the cross beam of a ceiling or other suitable stay, and within the top and bottom of the frame are guideways on which a post is mounted to slide longitudinally, the post being moved by crank handles near the top and bottom operating screw rods which have their bearings in the frame. On the post is a rack into which meshes a gear wheel mounted on a vertically sliding frame, with crank arm, ratchet wheel and pawl, to adjust the frame in any desired position; and mounted on this vertically sliding frame is a shaft turning in suitable bearings, with a projecting end in the form of a fork carrying an arbor in which is held the circular saw to be operated on. Upon a shaft above the saw, operated by a belt receiving power from any source, is secured a swinging frame carrying a grinding wheel for sharpening the saw teeth, and operated by the shaft, the swinging frame being held in its uppermost position by a rope connected with a



SLATER'S CIRCULAR SAW HOLDER.

spring. An anvil is placed near, for hammering the saw when necessary, and in front is a vise with a fixed jaw on which is hinged a swinging jaw, enabling the saw to be clamped between them for swaging or filing purposes, the two jaws being held in closed position by a U-shaped clip. With this construction the saw can be quickly placed in position to be operated on by the grinding wheel, or clamped in the vise for filing or swaging, or placed with either of its faces on the anvil to be operated on with a hammer or other tool.

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An Early Inventor in Electric Lighting.

The Rev. G. H. Staite, vicar of Sutton Cheney, Hinckley, writes to the *Pall Mall Gazette* as follows:

"Knowing your love of fair play and readiness to ventilate hidden grievances, I venture to ask the insertion of this letter, in the belief that if the facts were known, some among your many readers would be inclined to entertain the claims of the family of a man who spent his life and fortune on a recognized public work of the greatest importance. My father was the originator of electric lighting, his exhibitions extending from 1847 to shortly before his death in 1854. During that interval he expended a considerable fortune, and left his family penniless. There are at the present time his widow, aged eighty, two daughters, and myself. That our claims to recognition are not unfounded will be seen from the following testimony: Prof. Tyndall, 'Fragments of Science,' Vol. II., p. 424: 'To keep the carbons at the proper distance asunder regulators were devised, the earliest, I believe, by Staite.' Haydn's 'Dictionary of Dates,' later editions, 'Electric Light': 'Apparatus for regulating the electric light were devised in 1846 and shown by Staite and Petrie in 1848.' Urquhart, 'Electric Light,' edited by Webb, 1880, p. 161: 'Staite and Edwards patented an electric regulator based upon the heating and expansion of metals by the current to be regulated. This idea, beautiful in itself, is really the original of the regulators used to-day, and the self-same principle is employed by Mr. Edison.' And 'Dr. Siemens,' page 173: 'Staite as early as 1847 patented a lamp in which the lower carbon is controlled by a movable soft iron core acted on by a hollow electro-magnet.'

"Fontaine and Du Moncel gave similar testimony. The priority of the principle of automatic regulation, the *sine qua non* of electric lighting, was decided in my father's favor by the French Academy of Sciences, as recorded in *Le Courrier Francais*, February 4, 1849. Of his many patents and improvements no use could be made by his family; practically, as far as they were concerned, they died with my father, although they were and are still available for subsequent workers in the same field. His family feel that they have entirely lost their fortune through his public enterprise. All their money, consisting of thousands of pounds, was sunk, and by the premature death of the inventor in his forty-second year his and their hopes of any pecuniary return were irretrievably lost. It is this combination of facts which induces me to write this appeal, every point of which I shall be most glad to substantiate should any one be kindly induced to notice it."

What Flowers will Grow in the Shade?

The question, "What flowers will grow in the shade?" is put to me every spring, says the editor of the *Horticultural Times*, by scores of city people whose little garden, which they wish to devote to flowers, is so walled up by neighboring houses that the direct rays of the sun never touch it. But few plants will develop their flowers there, and none will do it so well as if it were lighted up by sunshine a part of the day. Fuchsias, pansies, forget-me-nots, violets, lobelias, lily of the valley, hollyhocks, phloxes, and other herbaceous plants whose native habitat is a shady wood, will do best, but even these languish if denied all direct sunlight. The best effect in such situations is produced by ornamental leaved plants, the beauty of which is not dependent upon their flowers. Among these may be ranked the gold and silver variegated leaved geraniums, achyranthes, alternantheras, begonias, caladiums, centaureas, coleuses, etc., which, if planted so as to bring the various shades in contrast, produce a pleasing effect, which continues during the entire summer months, and is not surpassed by any display of flowers. The cultivators of flowers in rooms should understand the necessity of sunlight to plants that are to flower, and endeavor to get these as close as possible to a window having an eastern or southern aspect. The higher the temperature, the more plants suffer from want of light. Many plants might remain semi-dormant in a temperature of forty degrees—in a cellar, for example—away from direct light, for months, without material injury; while if the cellar contained a furnace keeping a temperature of seventy degrees, they would all die; such would particularly be the case with plants of a half hardy nature, such as monthly roses, carnations, fuchsias, geraniums, etc. In our greenhouse culture of flowers, direct sunlight is an all important consideration, and a spell of sunless weather in midwinter is often a loss to us of hundreds of pounds, by preventing the development of flowers. Hence we use every means at command to dispose the plants to secure the greatest amount of light. The debilitating effects of want of direct light on plants are well illustrated by taking a vigorous plant in full foliage and flower, that has been growing in the direct light of our greenhouse benches, and placing it under the bench. If the temperature is high—say seventy degrees—in forty-eight hours the sickly signs showing want of light will be apparent to an experienced eye, in a week its condition would be such as to indicate sickness to the most common observer, and in a month it would, most likely, be dead.

EXPERIMENTS IN STATIC ELECTRICITY WITH THE INCANDESCENT LAMP.

BY ELMER E. E. EMMONS.

The incandescent lamp is generally classed among the applications of dynamic electricity, and, practically speaking, it properly belongs there, but many who are interested in science may be interested to know that the incandescent lamp may also be classed with the apparatus for studying the phenomena connected with static electricity.

With an Edison lamp, two or three suspended pith balls, some fragments of light material, and a silk handkerchief, the two fundamental laws of static electricity may be demonstrated.

The lamp should be held by the small end and the glass bulb rubbed with the handkerchief and then presented to the substance experimented upon. The bulb should be heated slightly to dry it.

Now, if a lath is balanced on a point on the bottom of a round-bottomed bottle, it can be made to revolve by holding the rubbed bulb near one end. (Fig. 1.)

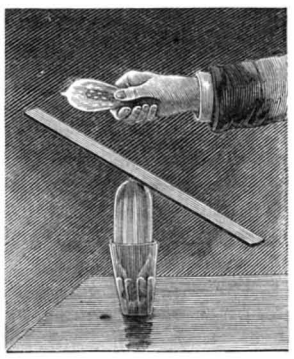

Fig. 1.

In fact, any experiment that can be made with a glass rod or stick of sealing wax can be made with the lamp.

If, in the dark, the lamp is held by one hand and the bulb rubbed with a piece of cloth, the interior becomes filled with a bluish white light. (Fig. 2.)

I find that the hand is as good as anything for the above experiment, for if the hand be moved rapidly up and down, striking the bulb a glancing blow as it passes, the glow may be made to fill the entire globe, and, after stopping, if the hand is placed against the glass, the interior will be immediately lighted up, and it may be repeated several times without more rubbing.

When a barrel of lamps is opened and the lamps gently stirred, the same glow spreads through the whole mass of lamps disturbed.

In the above experiments the carbon filament may be entirely destroyed, and for the experiments in attraction and repulsion the lamp would be somewhat improved thereby.

Fig. 2.

It is, however, as a condenser that the lamp excels.

If the lamp is held by the bulb, and the metal piece connecting with the carbon presented to the prime conductor of an electrical machine, it will become charged, that is, if the person holding it is standing so as to be "grounded."

The lamp can also be charged by an electrophorus, or from a running belt if the latter is charged.

If, when the lamp is charged, the holder touches the metal with his free hand, he will receive a smart shock. If another person touches the metal on the lamp, they both will receive a shock, the circuit being completed through the ground.

If the lamp is held long enough, the time depending on the quantity of electricity to be derived from the charging device, the lamp will finally discharge itself, the spark jumping from the metallic portion of the lamp to the hand of the holder, and the holder is made aware of the fact by the loud snapping sound and a pretty heavy shock. (Fig. 3.)

Fig. 3.

By watching, the spark may be seen as it jumps the interval.

By taking hold of the lamp well down toward the end of the bulb, the spark can be made to jump the whole distance between the ferrule and the hand, a distance of three inches or more.

It is really astonishing what a heavy shock one can get from a 16 candle lamp; and if the original inventors of the Leyden jar had been holding a healthy incandescent lamp in their hands instead of the historic phial of water at the time they received their first shock, it is probable that they would never have ventured near enough to have taken another, judging from the fright the phial caused.

To make a first-rate Leyden jar the lamp should have tin foil pasted over it to within 1½ inches or 1¾ inches of the ferrule. It may then be held in any convenient way suitable for experiment.

With a lamp so arranged, all the experiments usually made with Leyden jars can be performed.

The foil is, of course, to be connected with the earth. Running a wire to the floor is usually sufficient.

I have taken with the foil on it, suspended it near a running belt, connected the foil to "ground" by running a wire from it to the floor and then run a wire from the metal connection to within a few inches of the belt. So arranged, the lamp will become charged very rapidly and discharge, the spark leaping through the air between the ferrule and tin foil and close to the glass. (Fig. 4.)

Fig. 4.

During the time of charging, the space inclosed by the carbon filament is filled with a pale blue light, and at discharge the whole globe is illuminated, the light being due to discharge in vacua, and not to the carbon being heated.

If the carbon is broken in two, it works just as well, so that burned-out lamps may be obtained and used. Any one who has ever tried to make a Leyden jar knows the difficulty in getting good glass, but the lamp is perfect in that respect.

Artesian Wells in New York City.

In a paper on the geology of Manhattan Island, read by Mr. James F. Kemp, before the New York Academy of Sciences, we find the following: Efforts have been made since the beginning of the century to obtain water from wells, both surface and artesian. Dr. Elwyn Waller informs me that over a thousand exist at present. Within the last ten or fifteen years, very many artesian wells have been sunk by the oil well methods and the diamond drill. Many of the large breweries, malt houses, and manufactories demand an abundant supply of water, and have found it advantageous to sink wells in preference to paying the city water rate. Sometimes they are successful in striking a wet spot and a good supply is obtained, but, as there is no certainty from the nature of the formation, they quite as often yield very little. Still, the straitened capacity of reservoirs and the small head allowed consumers have greatly quickened the well industry. They are drilled by the methods perfected in the petroleum districts, and, indeed, one can hardly journey very far around the city without seeing the tall derrick and hearing the creak of the bull wheel and the thud of the drill. The wells are sunk by contract at from $6 to $12 per foot, the contractor fixing his price on his estimate of the hardness of the rock. Much difficulty is experienced on account of this varying hardness, as the drill tends to glance and make a crooked hole. Ordinarily the progress is 20 feet in 24 hours. The drillers say they are obliged to go down from 400 to 1,000 feet to strike water. The following facts have been obtained by inquiring of the drillers, and may not be very exact:

	Feet.	Daily.
Schaefer's Brewery	640	5,000 bbls.
63d Street Malt House	414	2,700 "
Third Ave. and 67th Street	1250	10,000 gals.
Sixth Ave. and 59th Street	730	10,000 "
Field's Building, 1 Broadway	400	57,000 "
Foot 58th Street, Hudson River	700	Unsuccessful.
Munic. Gas Co., 11th and 45th, 2 wells	500	each 30–45,000 gals.
Tenth Ave. and 39th Street	468	40,000 "
W. 41st Street, No. 529	585	20,000 "
Foot W. 39th Street	550	90,000 "
Sterns, Third Ave. and 42d Street	600	8,000 "
11th Ave. and 48th Street	600	30,000 "

99th Street and Second Avenue, 7 wells, 38 feet each in drift, total of 216,000 gallons per day.

The Last Herd of Buffalo.

Mr. Clinton A. Snowden, of the Chicago *Times*, is the originator of a scheme to save bisons that still remain on the plains. It has been ascertained that of the millions which once roamed on the prairies of the West only seventy-five or a hundred remain, and these are located in the extreme southwestern portion of Texas. An expedition is soon to start for Texas to round up there for buffalo. The leading purpose is to perpetuate a species of animal which is thoroughly typical of American animal life; one of the controlling ideas of the trip being to kill none of the animals while corraling them or after their capture. News of the work of the expedition is to be sent to the *Times* by carrier pigeons.

It is to be hoped this laudable expedition will succeed. It would seem as if Congress might do something to promote and encourage the preservation of this wonderful breed of animals.

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Cement Floors.*

Such floors, when properly made, are very valuable for barns and outbuildings. In the first place, they are impervious to liquids, and will retain all the manurial matter that is placed on them. In the second place, rats and other vermin cannot burrow through them, and, so far as my experience goes, will not burrow under them to any great extent. Floors made with American cement will not generally be tough enough to withstand the treading of animals, and should be protected by a covering of boards. A covering of English Portland cement about two inches in thickness, made by mixing three parts of sharp sand to one part of cement, with water just sufficient to damp it, and thoroughly rammed in place, will stand treading of animals, but will, I think, in most places be more expensive than a board covering.

METHOD OF CONSTRUCTION.

A foundation for such floor should first be made. This is done by laying a course of small stones from two to four inches in diameter. Ram these in place with a ram made of a block of wood about 10 inches in diameter at the lower end, and two or three feet long. After this course of stones is in place, make a mortar by using one part, by measure, of quicklime, one part of American cement, ten parts of sand and sufficient water to make it very thin. Pour this water as soon as mixed on the course of stones, and with a common hoe work the mortar into all the cracks. Sufficient mortar will be used when the cracks are full. After the first course is completed, a second one should be put on. This will make a total thickness of about six or eight inches. If a floor is to be laid for a stable, joists of two by four scantling should be bedded in the upper course and allowed to project about one-half inch above the course. Before the floor is laid, a mortar made of one part quicklime, one part American cement, and six parts sharp sand is spread over the surface and leveled off from joist to joist. The boards or planks for the floor should be laid at once while the mortar is soft. This last course of mortar may, with advantage, be replaced by a mortar made of hot coal tar and sand, mixed and applied while hot.

If the floor is not to be trodden on by animals, it will do to finish it with a coat of cement mortar, about one inch thick. The mortar for this finishing coat should be one part sand to one part cement and no lime. If a cement floor is needed for a stable, a covering of Portland cement mortar as described should be placed upon the stones.

I have seen very good floors made by mixing hot coal tar with sand and stones, instead of lime or cement, as described. This floor will give off its characteristic odor for a long time, however, and cannot be recommended when such odor is objectionable. The floors under the cattle stable and also the piggery at the Michigan Agricultural College were constructed substantially as described. All the surfaces of woodwork in contact with the mortar were first coated with hot coal tar. This work was done in 1871. In 1886 it became necessary to remove the piggery to a new site. The floor was well preserved, but the joists bedded in the mortar were badly rotted. The cattle stable floor is apparently in as good condition as when first put down.

I wish to say just a word regarding the use of cement and lime. Cement should be used as soon as mixed with water, as it very soon hardens or sets. This operation should not be disturbed, and if it takes place even in a small degree before the mortar is deposited in its permanent place, it will never become as hard as though it had not been disturbed. Lime mortar is rather improved than injured by allowing it to remain a long time after being mixed. In this article I recommend the use of equal quantities of lime and cement, solely on the ground of economy. If the foundation is, however, in the water, the lime should be replaced by cement, but for all ordinary circumstances a mixture of half lime and cement gives better satisfaction than pure cement—such a compound forms a water lime, that, although it will not set under water, still, when once it is set, will not be affected by water. For ordinary floors, I think it becomes in time harder than pure cement.

The Mosquito.

Mr. H. Sullivan Thomas, who has been lecturing on the mosquito before the literary society of Madras, India, is ungallant enough to say that it is only the female mosquito that does the biting. He considers the mosquito a most useful pest, seven-eighths of its existence being devoted to the service of man and only one-eighth to his annoyance. It exists in the larval state twenty-one days, and during that period engages in sanitary work with ardor and thoroughness. Wherever there is dirty water, wherever there is a filthy drain, there the mosquito larvæ are to be found, voraciously devouring the contaminating matter. Mr. Thomas admits that he is an anomalous animal, who wears his heart where others wear their throat, and sows his wild oats at a time of life when the human kind try to make their fellows and heaven believe they have never been sinners; but his days of sin are only a tenth of his total existence, which is more than could be said of most animals, man included. And in clarifying the water of India, which needs the process so badly, the mosquito is performing a public benefaction, and atoning to some extent for the bloodthirsty appetite he develops during the three days he exists in the more familiar form. Mr. Thomas tells us he never yet found a case where a bite was inflicted by any other than a female mosquito; and though he suggested as a possible explanation that the male had quicker ears and might be more on his guard against being caught, this was obviously rather a concession to the feeling of the feminine portion of his audience than the expression of scientific conviction.

* Professor R. C. Carpenter, Michigan Agricultural College, in *Rural New-Yorker*.

Bullets for Small Bore Rifles.

A series of experiments have lately been carried out in Austria on the projectiles for small bore rifles. Three varieties of bullets, says *Engineering*, were used, namely, balls of hardened lead, of lead with a steel jacket, and of lead with a nickel jacket. In the experiments on penetration, copper-coated bullets were also employed. The rifles used were the Kropatschek and the Nagant. The first is of 0·315 in caliber and is rifled with four grooves, making one turn in 35 calibers. Its barrel is about 2 ft. 8¼ in. long, the weapon weighing slightly over 10¼ lb. The Nagant is of the same caliber, but is rifled with six grooves, with a pitch of 31 calibers. The barrel is of the same length as the Kropatschek, but the weapon weighs rather less, or about 8·84 lb. The bullets were tested with regard to accuracy of fire, penetration, and on the effect of prolonged fire, and in all these respects the jacketed bullets took the first place. In particular, by the rapid fouling which occurred with the hardened lead ball, the accuracy of the weapon was rapidly spoilt, which did not occur with the other projectiles. As regards penetration, the best results were given by the steel-coated ball, though the difference between it and the one with the nickel jacket was never very great, both bullets giving results greatly superior to those obtained with the hardened lead balls. The rifles were in no cases injured by prolonged firing of any of the projectiles.

A Novel Storm Anchor.

A so-called storm anchor, invented by Capt. Waters, and designed for the use of vessels in urgent distress at sea, has recently been successfully tried. The anchor is an ingenious yet simple and inexpensive contrivance. It is made of canvas in the shape of a bag. Two were used in the recent experiments, one being attached to a circular framework, the hoop of which is from two to three inches in width, the other fastened to a square framework of wood bolted together at the ends. The width across the openings of these bags is about four feet, the depth being about five feet. These anchors or bags are thrown into the sea, and made fast to the bow of the vessel by a stout rope. The immediate object of these anchors is to bring a vessel up head to sea when all other means have failed, and the vessel is in danger of foundering. Capt. Waters made use of a temporarily constructed arrangement of this kind in a terrific gale in the Bay of Biscay some years ago, when his vessel was in danger of foundering, and the craft, although only a small one, was brought head to the sea by this means, and successfully rode out the gale for fifteen hours, when it abated. The bags are eyeleted at the bottom to prevent the pressure of the water bursting them, and are attached at a short distance to a beam of wood, which suspends them a few feet below the surface.

The Wiesbaden Congress on Alcoholism.

On the 9th ult., the seventh Congress of German Physicians, re-enforced by investigators and special practitioners from all parts of the empire, met at Wiesbaden, under the presidency of Prof. Leube of Wurzburg. The feature of the Congress, however, was the paper by Dr. Binz of Bonn, and the debate that ensued, on "Alcohol as a Remedial Agent." Having shown the alternating affirmative and negative views held in recent years on the efficacy of this agent, Dr. Binz maintained that the preponderance of English authority was in favor of the former, and that this view was being re-enforced by German original investigators, who, like Zunz, had with much cogency advocated the non-heating and distinctly efficacious virtues of alcohol. Dr. Binz set himself to prove—(1) that alcohol has a value, not represented by any other agent, in heart failure and lung disease; (2) that it is a *Sparmittel* (economic factor) in the organism, because it is consumed therein; and (3) that it operates as a controller of pyrexia and fever. On the sick bed its virtues are invaluable; but in the healthy subject it is difficult to define where its abuse is not felt; for the man in good health needs no stimulation, no artificial economizer of energy or replacer of albumen, no depressant of temperature. All that can be proved in favor of alcohol in such a case is its power of renewing cerebral energy when lowered by mental work. Even here moderation in well-watered alcohol is imperative. Dr. Binz further contended that alcohol consumption between meals, especially in the form of beer, is a great and, in Germany, a national evil, practiced as it is in the stuffy atmosphere of cellars and that, too, for hours. Not only do the secondary products of beer exhaust the system and induce an adipose habit, but the habitual beer-drinker is as much an alcoholist as the drinker of drams, with this difference, that he has not the excuse of the latter in that moral wretchedness for which spirits are an immediate, though in the long run a fatal, remedy. Remembering all this, Dr. Binz concluded that there was a large, not to say an increasing, group of maladies—maladies in which idiosyncrasy was an important factor—where alcohol was imperative, and where no substitute for it could be found. In the discussion which followed, Dr. Binz was supported by Professor Jaksch of Graz, while Dr. Nothnagel of Vienna put in a special *caveat* against the exhibition of alcohol to children. The whole treatment of the question as officially reported will have much practical force, not only for the physician, but for the public hygienist and the legislator.—*Lancet.*

Photochronoscopic Method of M. Hermite.

To obtain a distinct photograph of an object moving with great velocity, as, for instance, a rifle bullet traveling at the rate of 400 meters (1,304 ft.) per second, is *prima facie*, and from the popular point of view, a somewhat difficult problem. It has been very neatly solved, however, by M. Gustave Hermite, under the condition that the object must be in darkness. He simply illuminates it by the spark from an induction coil. The sparks from this instrument occur at perfectly regular intervals of time, so that the only practical difficulty in carrying the suggested means into effect is to accurately measure the duration of the interval. This M. Hermite has accomplished by the use of a diapason, of which the number of vibrations per second is accurately known, and which is simply a thin strip of steel fixed in a metallic holder. It is set in vibration by bending it with the finger. If now it be illuminated by sparks from a Ruhmkorff coil, and the number of vibrations of the strip happens to be equal to that of the sparks, the strip will be seen in a position of inclination. If the number of sparks be double that of the vibrations, the strip will be seen in the form of a V. If there be discord between the numbers, the branches of the V will appear to close and then to open again. It will be seen that these phenomena afford a means of regulating the coil so that it may give a determinate number of vibrations and sparks per second; and the means in question are found to be very practical and very accurate.

Cost of the Production of Electric Energy.

M. W. Penkert, in the *Centralblatt fur Elektrotechnische*, gives some practical figures of the cost of electric energy variously produced. Although his figures are susceptible of modification for this country, yet the ratios they determine are highly interesting. The cost of developing 1,000 watts is:

2·66 fr.	when	produced	by Daniell's battery.
3·77 fr.	"	"	" Bunsen's battery.
40·07 fr.	"	"	" Clamond's thermo-electric battery heated by gas.
1·05 fr.	"	"	" Clamond's thermo-electric battery heated by coal.
0·26 fr.	"	"	" dynamo and steam engine.
0·62 fr.	"	"	" dynamo and gas engine.

In these calculations, 1·8 kilogrammes (4 lb.) of coal per horse power hour for a steam engine, and 1 cubic meter ($35\frac{3}{10}$ cubic feet) of gas for a gas engine for the same work was allowed for.

Tinning by Simple Immersion.

Argentine is a name given to tin precipitated by galvanic action from its solution. This material is usually obtained by immersing plates of zinc in a solution of tin containing 6 grammes (about 90 grains) of the metal to the liter (0·88 quart). In this way tin scrap can be utilized. To apply the argentine according to M. P. Marino's process, a bath is prepared from argentine and acid tartrate of potash rendered soluble by boric acid. Pyrophosphate of soda, chloride of ammonium, or caustic soda, may be substituted for the acid tartrate. The bath being prepared, the objects to be coated are plunged therein, first having been suitably pickled and scoured, and they may be subjected to the action of an electric current. But a simple immersion is enough. The bath for this must be brought to ebullition, and objects of copper or brass or coated therewith may be immersed in it.—*L'Echo des Mines et Metallurgie.*

Electroplating with Aluminum.

H. Reinbold claims to have obtained good results with the following solution: Alum 30 parts, water 300 parts, aluminum chloride 10 parts. This solution is heated to 200° Fah., and after cooling, 39 parts of potassium chloride are added.

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WADDINGTON'S ELECTRIC SUBMARINE TORPEDO BOAT.

Mr. J. F. Waddington's submarine torpedo boat has the spindle shape that necessarily characterizes such vessels. It is a boat of small dimensions, capable of carrying one or two persons, and is 36 feet in length and 6 in width. It is divided into three compartments by two bulkheads. The end chambers are filled with compressed air, which may be used as needed for respiration or for furnishing motive power.

The central chamber, which the officer occupies, contains enough air to allow two persons to remain in it for six consecutive hours. The foul air is expelled through special valves, that open automatically as soon as the internal pressure becomes greater than the external. It might be possible, however, to absorb the disengaged carbonic acid by means of chemical reagents, in order to keep the air from getting foul. The central chamber is provided above with a small lookout, containing large light ports, and which can be closed hermetically by a hatch that, at the same time, gives access to the interior. Movable hand rails can be put in place around the lookout when the boat is not submerged.

The electricity that furnishes the motive power is derived from accumulators of 600 amperes-hour each, the boxes of which, 45 in number, are arranged at the bottom of the central chamber. These accumulators are assembled in series and attached to the electric machine that directly actuates the propeller. The latter makes 750 revolutions per minute.

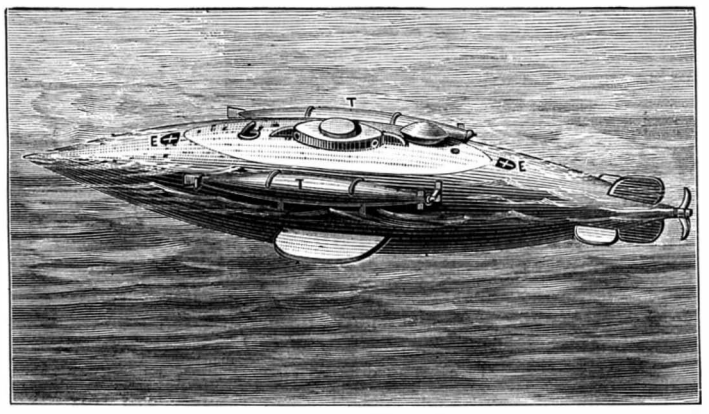
According to data published in the *Yacht* and *Industries*, a power of 7·96 electric horses, corresponding to a current of 66 amperes and 90 volts, permits of a trip of 80 miles being made at full speed, say for 10 hours at the rate of 8 miles per hour, without any necessity of recharging the accumulators. On diminishing the speed, 110 or even 115 miles might be attained. It is interesting to compare these figures with the results obtained by Capt. Krebs.

The boat is likewise provided with a well arranged system of connecting devices, submersion screws, counterpoises for ballast, etc.

Submersion is effected and regulated by means of two vertical helices contained in tubes resting against the bulkheads of the air chambers. Each of these is actuated by a special motor, and can thus be driven separately. The boat is provided, too, with two plates with counterpoises movable around a horizontal axis. These are situated on the outside, and can be maneuvered from within in order to effect a submersion while running. The boat has, in addition, four submersion rudders, two of them horizontal and two vertical, designed to assure a horizontal position. These rudders act automatically under the impulsion of a special electromotor, controlled by a sort of pendulum, and which enters into play as soon as the boat inclines the least bit. Finally, care has been taken to see that the boat can be at once brought to the surface in case of pressing danger, and, to this effect, it is provided beneath with a heavy weight that can be immediately detached. Two large boxes at the sides of the central chamber can be filled with water when the boat is on the surface and it is desired to prepare for submersion. By reason of its special destination the boat carries three torpedoes attached externally, but held merely by hooks that can be maneuvered from the interior. Two of them are self-moving topedoes, whose propeller begins to run automatically when they are detached from the boat. The third is a mine torpedo, fixed on the deck back of the lookout, and serves for attacking ships at anchor provided with their protecting nets. This the boat sets free under the enemy's ship, and then moves away, but remains in communication with the torpedo through electric wires that permit it to explode the latter at the proper moment.

As shown in Fig. 1, all the maneuvering levers are grouped in the central chamber within reach of the officer, who can, without exertion, effect all the necessary movements. Upon filling the side reservoirs with water at the surface, the buoyancy is diminished. The submersion of the boat while running is assured by acting, preferably, upon the lateral plates, so as to incline them. The speed then reaches five knots per hour. Recourse may be had also to the vertical screws, that serve to regulate the depth of submersion by their velocity; but they are especially employed to effect a submersion *in situ*.

From this description, it will be seen that all the details of this boat have been carefully elaborated, and there is reason to think that, without being yet definitive, this new type is destined to give important results in practice. The English journals, moreover, inform us that very encouraging trials of it have been made at Liverpool in the presence of delegates from various naval powers.—*La Nature.*



T T. Lateral torpedocs.

Fig. 2.—EXTERNAL VIEW OF THE BOAT.

Value of Gas Residuals.

Mr. Page, in a recent speech before the Ohio Gas Light Association, said: When I tell you that my associates and myself have marketed, in one contract, within the last four months, $200,000 worth of aqueous ammonia for ice making, you will have an idea of the extensive use of this residual in that industry. Twenty-one firms in this country are engaged exclusively in making refrigerating apparatus, the annual value of the work thus turned out being between three and five million dollars. One of the largest and most extensive cold storage warehouses (Boston, Mass.) in the world, costing a quarter of a million dollars to erect, recently finished putting in many thousands of tons of ice, at a cost of 85 cents per ton, but the proprietors are now examining the subject of artificial refrigeration by ammonia, with a view of displacing all that ice next year.

The steamship City of Para, running to Aspinwall, has been using for the last two and a half years a little ice machine for all the purposes of refrigeration. All the food used on the table (all the butter, cheese, beef, eggs, etc.) during the entire round trip of 21 days is preserved in that way, and what is left over comes back into New York harbor in a really better condition than it was when the voyage was commenced some weeks before. Prior to the introduction of artificial refrigeration on that vessel, their fresh meat would only last seven days.

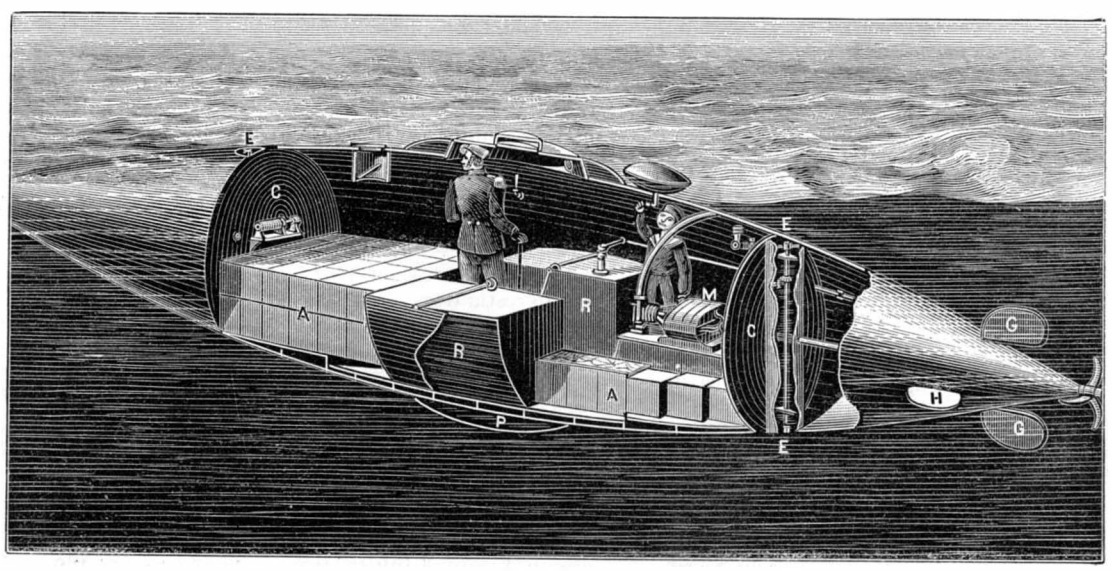
On 23d Street, New York City, they are fitting up a house where not only every appliance for using ammonia in refrigeration will be shown, but where they will furnish you a can of anhydrous ammonia that will keep a bachelor's refrigerator going for 30 days; and all the ammonia used is recovered, caught, and taken back to be again converted into the anhydrous article.

In the great refrigerators of the market houses, strawberries from Florida are being received and placed in the cold storage rooms (which are kept at the exact temperature wanted, all being governed by a thermostat), so that it matters not whether you want your strawberries now or next fall. You can have them when you wish. The 23d Street house is being fitted up so that if you chance to come to New York in hot weather and want to find a cool place, you can have it there. No matter how hot it may be outside, you can go in there and sit down to cool off. "What temperature would you like?" "Give me 10° below zero, and give it to me quick." You will get it, in about two minutes. All that, and a thousand times more, I might tell you is being done with ammonia.

I have made a contract to-day for the ammonia to come from the carbonization of 1½ million tons of coal, all for the use of refrigeration. I will to-day contract with you, gentlemen, at the English price, for the ammonia product of any number of tons of coal. There is a starter on your fuel product. Now as to the demand. In the last three years there has been no time when the ammonia tanks have not been cleaned out, because of this demand for it for artificial refrigeration.

There is no need of any doubt, then, as to what will become of the products. As to tar, not a barrel of it in any tank in this country to-day ought to be unsold. There never has been a time in the history of our business when tar products sold as well as at present—with the exception of 1873, when anthracene was at a very high price. The demand for these products is increasing with greater rapidity even than the increase in the demand for ammonia for artificial refrigeration. The streets can be kept perfectly clean with pitched blocks—blocks with pitch between and pitch underneath; and that kind of pavement is to-day taking from one-half to three-quarters of all the pitch being made from tar. Then look at the roofing business, look at the demand for tar-saturated paper.

One Philadelphian said that his sales last year amounted to 25,000 rolls of 2 and 3 ply paper. This proves that any man can put on a perfectly tight roof, for it only costs 2½ cents per square foot laid on the roofing boards. Then take creosote oil. Every gallon of creosote oil made this year has been sold—in fact, my impression is that some cargoes were imported from the other side to be used in wood preservation. Wood-preserving works are being built rapidly. The demand will grow faster for creosote oil than it can be made from all the tar from fuel gas. Take carbolic acid. The price has risen nearly 100 per cent in the past eight weeks. Why? Because they are making an acid from it forming the base of an explosive which is being used very largely. It would take almost a day to merely enumerate the uses of these products which come exclusively from the two residuals—tar and ammonia.



C C. Bulkheads. A A. Accumulators. M. Dynamo machine. R R. Reservoirs. G G and H H. Rudders. P. Weight. E E E. Tubes inclosing the shafts of the vertical screws.

Fig. 1.—THE WADDINGTON ELECTRIC SUBMARINE TORPEDO BOAT.

Gasoline Stoves and How to use Them.

This is the season, says the *American Artisan*, when consumers are buying and beginning to use gasoline stoves. Stove dealers should spare no pains to explain to purchasers of vapor stoves the nature of gasoline and to impress upon them the importance of care in the use of it as fuel. Most stoves are now so made that it is impossible to fill them while the burners are lighted, but if a stove is sold not so constructed, the purchaser should be urged never to fail to turn out all burners before filling. With lay-down tanks and other devices it is possible to overflow the tank or to spill oil on the floor. If this is done, the burners should not be lighted until the fluid has been wiped up and doors and windows opened, and the room thoroughly aired, so there should be left in the room little or no gas from evaporation. It is only by the grossest carelessness or most willful refusal to adhere to instructions in the operation of gasoline stoves that an accident is possible in their use. But accidents may happen where fire is present, whatever the form of fuel or construction of stoves.

Occasional complaints are made that ovens of gasoline stoves do not bake well. When they do not bake well, it is more than likely to be the fault of the operator. A frequent trouble in baking with gasoline stoves is that the bread, meat, or pastry is put in as soon as the burner is lighted, instead of waiting until the oven is thoroughly warm. It is impossible to obtain good results when this is done. It does not take nearly so long to heat a gasoline oven as it does that of a coal or wood stove, but it is no less important that it should be well heated.

Glycerine Soap.

Stearine	13 pounds.
Palm oil	22 "
Glycerine	13 "
Lye 28°	17 "
Alcohol, methyl	26 "

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Carolina Clay Eaters.

A short time ago Dr. Frank H. Getchell, of 1432 Spruce Street, Philadelphia, went on a gunning expedition to North Carolina. His quest for game led him into the wild country back of Salisbury, which is inhabited, for the most part, by a miserable race of beings with only just enough energy to eke out a wretched existence. These creatures are nearly all veritable living skeletons, and with few exceptions are addicted to the habit of clay eating.

While shooting wild turkeys and other game in this wild region, Dr. Getchell made an incidental study of this peculiar habit or vice among the inhabitants. It is a mountainous country, and in the spring little rivulets start out from the caps of snow on the mountain, and as the days grow warmer, the little rivulets become torrents, and great washouts are made along the mountain side.

The soil is of a heavy, clayey nature, but there are strata of clay that is heavier than the rest, and when the water rushes down, this clay is formed into little pellets and rolls and accumulates in heaps in the valley. These little pellets and rolls are what the clay eaters devour with as much avidity as a toper swallows a glass of whisky.

"Among the poor people of this section," said Dr. Getchell, "the habit of eating clay is almost universal. Even little toddlers are confirmed in the habit, and the appetite seems to increase with time. While investigating the matter, I entered a cabin occupied by one of these poor families, and saw a little chap tied by the ankle to the leg of a table, on which was placed a big dish of bread and meat and potatoes within easy reach. The child was kicking and crying, and I asked his mother why she had tied him up. She replied that she wanted him to eat some food before he went out to the clay, and he refused to do so. The woman confessed that she ate the clay herself, but explained that the child's health demanded that it eat some substantial food before eating any earth. Almost every one I met in this section was addicted to this habit. They were all very thin, but their flesh seemed to be puffed out. This was particularly noticeable about the eyes, which had a sort of reddish hue.

"All of the clay eaters were excessively lazy and indolent, and all of these conditions combined led me to the conclusion that there must be some sedative or stimulating qualities, or both, in the clay, and I determined to find out whether there was or not. I consequently brought a lot of the clay home with me, and Professor Tiernan and myself made an analysis of the stuff, and discovered that instead of clay eaters the inhabitants of central North Carolina should more properly be called arsenic eaters. All of this clay contains arsenic, but exactly in what proportion we have not yet discovered. Arsenic eating is common in many parts of the world, and is practiced to a greater or less extent throughout the world. It acts as a sedative, and also as a stimulant. The mountaineers of Styria, Austria, are habitual arsenic eaters. They give as their reason for eating it that they are better able to climb the mountains after eating the poison, and their explanation is a perfectly reasonable one, as arsenic acts as a sedative to the heart's action. The habit is also prevalent in the Tyrol and in the Alps.

"It is also said that the peasant girls of Switzerland and parts of Germany and in Scandinavia eat arsenic to give luster to their eyes and color to their cheeks; but this is a matter I have not investigated. It has been shown that arsenic or arsenical fumes are a sure cure for intermittent fever. The inhabitants of a section of Cornwall, England, at one time suffered with this type of fever, but when the copper works were established there the fever disappeared. This was accounted for by the arsenical fumes created in the treatment of copper. As to whether arsenic eating shortens life I am not yet prepared to say, but I intend investigating the matter thoroughly."—*The Clay Worker.*

A New Island.

The government of Batavia has made known to the Admiralty that the commander of the ship Samarang, of the royal navy of the Netherlands, reports the existence of a low, wooded island, which up to the present has never been marked upon any map, and which is situated to the west of Selaroo, one of the Timor Laout Islands.

This island appears to be about two miles long from N.N.E. to S.S.W., and nearly two-thirds of a mile wide. Its position, calculated approximately, from the center of the island, is 8° 15′ south latitude and 130° 39′ east longitude.—*Gazette Geographique.*

THOMAS SILVER.

Among the most serious difficulties which at first attended the use of steam machinery at sea was the excessive straining of the engines for lack of a highly sensitive governor or regulator. By the rolling or pitching of the vessel the wheels or propellers were thrown out of water, and the engines, thus relieved of duty, would instantly start off with terrific speed, shaking the ship from stem to stern, injuring the machinery, and endangering the lives of all on board. Among the vessels disabled and lost at sea from this cause was the steamship San Francisco, in 1854.

The world is indebted to the genius of Thomas Silver for an invention which proved an almost perfect remedy for this trouble. Silver's marine governor soon came into extensive use. Its adoption was ordered on American and British ships, as well as those of other nations.

It was placed on the engines of the steamer Atlantic, of the old Collins line; also on engines at the United States Mint, Philadelphia Arsenal, and on the printing presses of the *Public Ledger*, of Philadelphia, and *Tribune* and *Herald*, of New York, which reported it as "operating more quickly and correctly, even for stationary engines, than the old two-ball governor, which depended upon gravity." Mr. Silver's greatest success with it was in Europe. Admiral Pairs introduced the

THOMAS SILVER.

governor in the French navy in 1855, maintaining "it was just what always had been needed." Vessels on the Continent soon adopted it. John Hamilton and, later, Osborne & Co., engineers on the Clyde, became the manufacturers, realizing large fortunes, though opposition was continual, one house in Glasgow confessing candidly as a reason for not using it that they realized $25,000 yearly by repairing engines on which it was not used.

At the Royal Institute, of London, it was resolved that "Mr. Silver had done as much as any man living to facilitate steam navigation, enabling steam vessels to weather all gales without danger of broken shafts, wrecking, and consequent loss of life." Prince Albert said: "Mr. Silver, it is too common sense a thing; engineers *must* use it." The British Admiralty ordered it into general use in 1864, and so did all the naval authorities of the world, excepting that of his own country, the United States.

Thomas Silver, civil engineer and inventor, died in New York, April 12, 1888. He was born June 17, 1813, in Cumberland County, New Jersey, of American parents, belonging to the "Society of Friends." When a boy he developed mechanical ingenuity, and at the age of nine years his little boat, with hidden propeller wheel and other devices, was the wonder of the country village. Models of his many subsequent inventions are at the Patent Office, Washington, Kensington Museum, London, and the Conservatoire des Arts, Paris.

He was a member of the Franklin Institute, of Philadelphia, and of different societies in Europe, and awarded several medals. His latest inventions were a mechanical lamp, and a lamp burner made to dispense with glass chimneys, which is a great economical success. Our portrait is from a photograph by Tourtin, Paris.

Advantages of Good Water Supplies.

All time saved from hard labor is a gain. The convenience in cities and towns is a great advantage. In estimating the returns to be secured from a water supply for a place, consideration must be had for items not appearing on the company's books, but which have a value inestimable in dollars. These are:

First—Promotion of health. Water from a supply system averages much purer than from wells. It is stated that typhoid fever has practically become a country disease. In certain New England counties the lowest average mortality is in districts where there are many cities and towns, most of which have water supplies and sewerage systems. The highest mortality is in sparsely settled towns having no public works of this nature. Without a water supply we can scarcely have any sewerage system. The sprinkling of streets and decrease of repairs on gravel and macadamized roads are worthy items.

Second—By saving property. A supply of water for fire purposes can best be provided in connection with the domestic supply, and the power to prevent a widespread conflagration lies usually in the proper arrangement of the water supply system, where the hydrants should not be located too near large wooden buildings.

Third—By reducing insurance. The insurance companies of New England are always ready to recognize the introduction of water by a very substantial reduction of their rates, generally from twenty to fifty per cent.

Fourth—By encouraging manufactures. Many mills have private fire appliances, but all need external protection, and a reliable water supply and a consideration of its provisions and the consequent insurance rates often determines the location of great manufactories.

President Fanning stated that he had found that, for five years after the water supply was introduced in a certain city, the saving in insurance over the rates that prevailed before had been greater than the cost of the supply during that period. —*F. L. Fuller.*

Garnets on Manhattan Island.

The occurrence of garnets on our island is well known, and their development at places has often attracted the attention of mineralogists. The very large and impressive specimen obtained by Mr. I. I. King, and now in possession of Mr. G. F. Kunz, is perhaps the most famous example of this species from within the limits of our city. Numerous specimens of considerable beauty and fair growth were obtained during the excavations and blastings necessitated by the prosecution of the work of sinking the tracks of the N. Y. Central R.R. below the surface of Fourth Avenue, and the gneissic and schistose beds of the island have afforded this interesting mineral in great numbers, but of imperfect character and usually of small and inferior size.

Recently Mr. Gilman S. Stanton, a young and alert mineralogist, has disclosed the presence among our rocks of a very elegant crystallographic combination of this mineral (trapezohedron truncating edges of the rhombic dodecahedron), which, symmetrically developed and deeply colored, attain sizes varying from a little over an inch to one quarter of an inch in axial diameter, and form very pretty groups. This habit, justly admired by mineralogists, characterizes the Alaskan variety, which these in that respect resemble. They do not, however, possess the hyacinthine hue of the Alaskan examples, and are less translucent. In texture they are minutely fractured. They occur in a vein of coarse granite, are generally implanted in or near the feldspar elements, and when taken out present blurred or dull faces arising from a thin film of ferruginous clay deposited by infiltration. They have been formed in all probability slowly, and have not suffered distortion to any extent from disturbance during their formation, or by vein motion. They belong to the almandite variety of garnets (iron alumina), so far as can be judged, and present red to brown-red internal reflections.

EXTENDED observations at Paris and at Munich indicate that the sanitary condition of a locality depends on the amount of water contained in the ground. The years in which there has been a large quantity of ground water present have invariably been the healthiest, while those in which there has been a smaller quantity have invariably been the unhealthiest.

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The Protection of Buildings from Lightning.

The elementary notions about the efficacy of lightning conductors have received, says *Industries*, a rude shock from the investigations of Professor Oliver J. Lodge, which he brought before the Society of Arts in the Mann lectures, delivered on the 10th and 17th of March. The lecturer wisely determined to discard all preconceived notions which are current regarding the nature of lightning strokes, and to start his investigations on a perfectly new experimental basis. In his experiments he did not use the method adopted by Franklin, who, as is well known, flew a kite and obtained electric sparks from the clouds; but he used a Voss induction machine and Leyden jars, by which means the element of danger in the experiments was obviated, while at the same time the phenomena were under better control.

The arrangement of the apparatus may be thus briefly described: The terminals of the Voss machine were connected with the inner coatings of two Leyden jars standing upon the table, while their outer coatings were connected with two metal rods supported on glass stands. The ends of these rods, which terminated in knobs, could be approached more or less, and thus the sparking distance could be varied. The potential on the two outer coatings when the charge is slowly accumulating must evidently be equal; but when a spark occurs at the machine between its electrodes, the distribution of electricity is disturbed, and a second spark may occur between the sparking rods.

If, now, these sparking rods should be joined by a stout copper wire of very low resistance, it would at first sight appear that no spark at all could be obtained, however near the knobs were placed. But, to the surprise of everybody who saw the experiment, the length of spark was scarcely diminished by joining to the knobs the ends of a No. 1 B. W. G. copper wire running round the room.

We have then this extraordinary phenomenon, that although the two rods are in perfect metallic connection, the discharge prefers to take the short path through the air, which must have an enormous resistance, rather than the long path through the copper wire, which has practically no resistance. The explanation, as given by Professor Lodge, is that the self-induction of the copper wire is so great as to almost entirely prevent the passage of a current within the very short time the spark lasts.

A thin iron wire of equal length was then substituted for the copper wire, and although this had a considerably higher resistance, the sparking distance was not materially altered. It was, in fact, slightly less with the i on wire than with the copper wire.

Now, according to preconceived notions, the copper wire should have offered a much easier path for the passage of the current than the iron wire. In fact, when Professor Hughes showed some years ago his classic experiment on self-induction of straight wires, the conclusion was generally drawn from that experiment that lightning conductors should not be made of iron, but always of copper, because a wire of the latter metal has very much less self-induction.

It is well known than an iron wire when traversed by a current becomes circularly magnetized, and thus its coefficient of self-induction is increased as compared with copper, which, being a non-magnetic metal, cannot become so magnetized. But these experiments were made with currents of a period which must be regarded as slow in comparison with the rapidity of a lightning discharge; hence the iron had time to become magnetized, and develop a counter electromotive force.

In Professor Lodge's experiments it appears that the time of the discharge is too short to allow the iron wire to become magnetized, and its greater resistance would seem to constitute even an advantage in slightly diminishing the length and violence of the spark. To further elucidate this point, the lecturer inserted a capillary tube of very high resistance (some 100,000 ohms) as a shunt between the sparking knobs, and it was found that the energy of the spark had much diminished.

The influence of self-induction was also shown by a subsequent experiment in which a shunt between the sparking knobs was formed by a strip of tinfoil folded zigzag, with insulation between adjacent layers. Such a conductor has very little self-induction, and accordingly the sparking distance was much smaller than with the straight copper wire.

A tinfoil of equal length, but wound spirally upon a glass tube, was then inserted, and the sparking distance was found to be considerably greater. This was evidently due to the greater self-induction. Now, upon inserting an iron core into the glass tube, it would be expected that the length of the spark would sensibly increase, because the tinfoil and iron core would act as a very powerful induction coil when traversed by alternating currents of moderate period.

Upon trying the experiment, it was, however, found that no increase of sparking distance resulted from the insertion of the iron core, and it was thus made evident that iron at these rapid alternations completely loses its magnetic properties. The great obstruction which even a stout copper wire offers to the passage of a very rapid current was further shown by the experiment of connecting one end of the wire to one terminal of the machine only, and bringing the other end near it within sparking distance.

When a discharge occurs at the machine, a spark is also formed between the ends of this wire loop, showing that the current prefers to flow from the nearer portions of the loop, and leap across the air space rather than flow round the wire.

All these experiments illustrate the well known occurrence of side strokes. If a flash of lightning strikes a lightning rod, it will sometimes run along the conductor for a certain distance, and then, without apparent rhyme or reason, leap across into the building and do considerable damage. The resistance of the conductor may be exceedingly low, and the earth may be very good; yet the discharge, after leaping through a few hundred yards of air into the conductor, does not take the path of least resistance along it to earth, but strikes off.

The explanation, according to Professor Lodge, is that the self-induction of the conductor, quite irrespective of its electrical resistance, is sufficiently great to prevent the passage of the current during the very short time of a flash, and thus forces the discharge laterally outward. He illustrates this by hydraulic analogy. Suppose we have a tube bent into a U-shape and filled with water. If on the surface of the water in one limb is laid a piston, and a gradual pressure is applied, the water will be forced out of the other limb without causing any sensible strain on the tube; but if the piston on the surface of the water be struck a violent blow with a hammer, there is no time for the water to escape, although the tube may be very wide, and in that case the tube is liable to burst.

The side flash from a lightning stroke corresponds to the bursting of the tube, and the evident remedy in the case of the tube is to make it of an elastic material; and in the case of the conductor, to give the system some elasticity of another kind, viz., more electrostatic capacity. This might, for instance, be done by connecting the conductor with one of the coatings of a Leyden jar. Recently Professor Lodge showed that by this means the sparking distance between the knobs could indeed be slightly diminished.

The capacity of jar required for an actual lightning conductor would, however, be far too great to admit of such an arrangement in actual practice, and as a substitute the lecturer suggested that metal roofs and large conducting surfaces about the building should be connected with the conductor, so as to act as condensers. He also recommended to form the conducting system of a large number of thin wires in preference to the employment of a single thick wire.

The lecturer imitated the action of lightning by employing two metal plates fixed horizontally one above the other, but insulated from each other. The lower plate represents the earth, and the upper plate a cloud charged with atmospheric electricity. Into the intervening space are placed conductors terminating in metal knobs or points, and their upper ends can be set at various distances from the upper plate.

Upon charging the upper plate from the machine, a lightning stroke can be produced which will strike either one or the other of the objects placed between the plates, and by this means can be determined the liability which different objects have of being struck. When the charge slowly accumulates on the upper plate, a point is struck sooner than a sphere, even if the point is further from the plate than the sphere; and between two spheres of unequal diameter, a smaller sphere is more liable to be struck, although lower than the larger sphere.

On the other hand, if the charge, instead of slowly accumulating, is suddenly transferred from another body to the upper plate, all objects are equally liable to be struck. Such a sudden transfer of the charge takes place when lightning strikes from an upper to a lower cloud, and in this case Professor Lodge's experiments make it evident that the lightning rod has no protective zone, and that the body of a house may be struck although its lightning rod and conductor may be in an excellent condition.

From Professor Lodge's experiments it would appear that absolute immunity from the danger of lightning is not attainable, but that we may minimize the danger, not by the employment of high lightning rods and a few stout conductors, but by fitting the eaves and roofs of buildings with barbed wire, and connecting the wire in a great number of places with the earth by iron wires of comparatively small section. Professor Lodge recommends ordinary galvanized telegraph wire as preferable to copper wire, partly for electrical reasons and partly because it is not liable to be stolen.

Liquid Blacking.

This blacking is made by digesting in a close vessel at a gentle heat and straining:

Lampblack	1	drachm.
Oil turpentine	4	"
Methyl alcohol	12	ounces.
Shellac	1½	"
White turpentine	5	drachms.
Sandarac	2	"

The Roman Catacombs.

As reported in the *Architect*, London, a lecture was delivered lately in Liverpool, by Professor Stokes, of Dublin, on "The Church and Catacombs of Rome." The professor said that his own idea before he studied the subject was that the city of Rome was built over them, that the catacombs had furnished the building material for the city thus erected, and that the early Christians having discovered those excavations under their houses, made secret entrances into them, so that when any danger threatened them, or when they desired to worship in secret, they just retired into those vast and gloomy recesses.

The catacombs of Rome, however, were of quite a different character. They were not under the city at all—they were all outside, they were excavated in the hills that surrounded the city. Nor were the catacombs the usual places of worship of the early Christians, because they possessed church buildings at a much earlier period than people imagined. There were writings showing that long before the reign of Constantine the Christians erected most magnificent churches. Eusebius told them that "not content with the ancient churches, the Christians erected spacious churches."

The edict of Diocletian ordered the destruction of the churches and the confiscation of lands attached to them, while there were other evidences of the existence of churches at the end of the third century.

The whole extent of the catacombs they knew not as yet, as most probably there were numerous catacombs still to be discovered. Competent authorities estimated the whole length of the catacombs as reaching 350 miles. This might seem an enormous length, but they must remember that the catacombs were excavated on different levels, so that four and even five galleries ran one above the other—in fact, the whole soil for thirty or forty miles around Rome was honeycombed with them. These galleries were narrow, and ranged from 2 to 4 feet in width, and were from 8 to 10 feet in height.

The lecturer next described the pagan burial clubs, and said the early church was built in the form of a catacomb, because it took the name, shape, and constitution of a pagan burial club. It was under the cover of these pagan burial clubs that Christianity seemed to have taken refuge and shelter for the first 200 years of its existence, and through the toleration afforded to those burial clubs the Christian church was enabled to execute the vast operations involved in the formation of the catacombs. They had the testimony of Tertullian that toward the end of the second century Septimus Severus owed a great deal to Christian neutrality in the great civil war which raged at that time. The Christians had grown so numerous that it was almost as important for them to gain their neutrality as it was to gain their active co-operation.

In his subsequent remarks as to the excavation of the catacombs, the lecturer explained the means that the church possessed to carry out such a vast work, and stated that the excavations were the result of the labors of the fossores or diggers, who were reckoned among the inferior clergy.

Deafening Floors.

Various expedients have been used and suggestions given for "deafening" floors, as it is called. We have all heard, says the *Building News*, of mortar mixed with chopped hay or straw—a kind of pugging laid on rough boards, carried by fillets fixed to the sides of joists. This sort of pugging has stood well for centuries, and is found to answer well as a deafening material. Among other substances used are dry lime rubbish, sand, lime, hair, and dry ashes, sawdust, and even cockle shells and cork chippings have been found in the floors of old houses. Any of these materials in layers of 1½ inches to 2 inches will suffice to deaden sound. Recent suggestions have been thrown out in our own journal by correspondents. One of these is to use thick felt laid below the floor boards. A French journal throws out another suggestion attributed to General Loyre, who proposes, instead of loading the floor with plaster, to fill in the space between the boarding and the plastering of ceiling with shavings which have been rendered incombustible by dipping them in a tub of thick whitewash. As it is known that soft substances inclosing air spaces form an excellent non-conducting material to sound, it is thought that the shavings so treated will be found of great service, and it is said they are so incombustible as to add considerably to the fire-resisting properties of the building. Where it is desired to disinfect the space between the floor and ceiling the shavings may be saturated with chloride of zinc, or the latter may be added to the lime wash. The shavings have at least the merit of being light, which some of the materials we have named are not, and if they can be rendered non-combustible—a very essential condition—we do not doubt that this kind of deafening, so cheap and easily procured, will be largely used. Slag wool made in the form of tiles or bricks is a good material to prevent the transmission of sound, and any fibrous material formed into cellular slabs answers the purpose.

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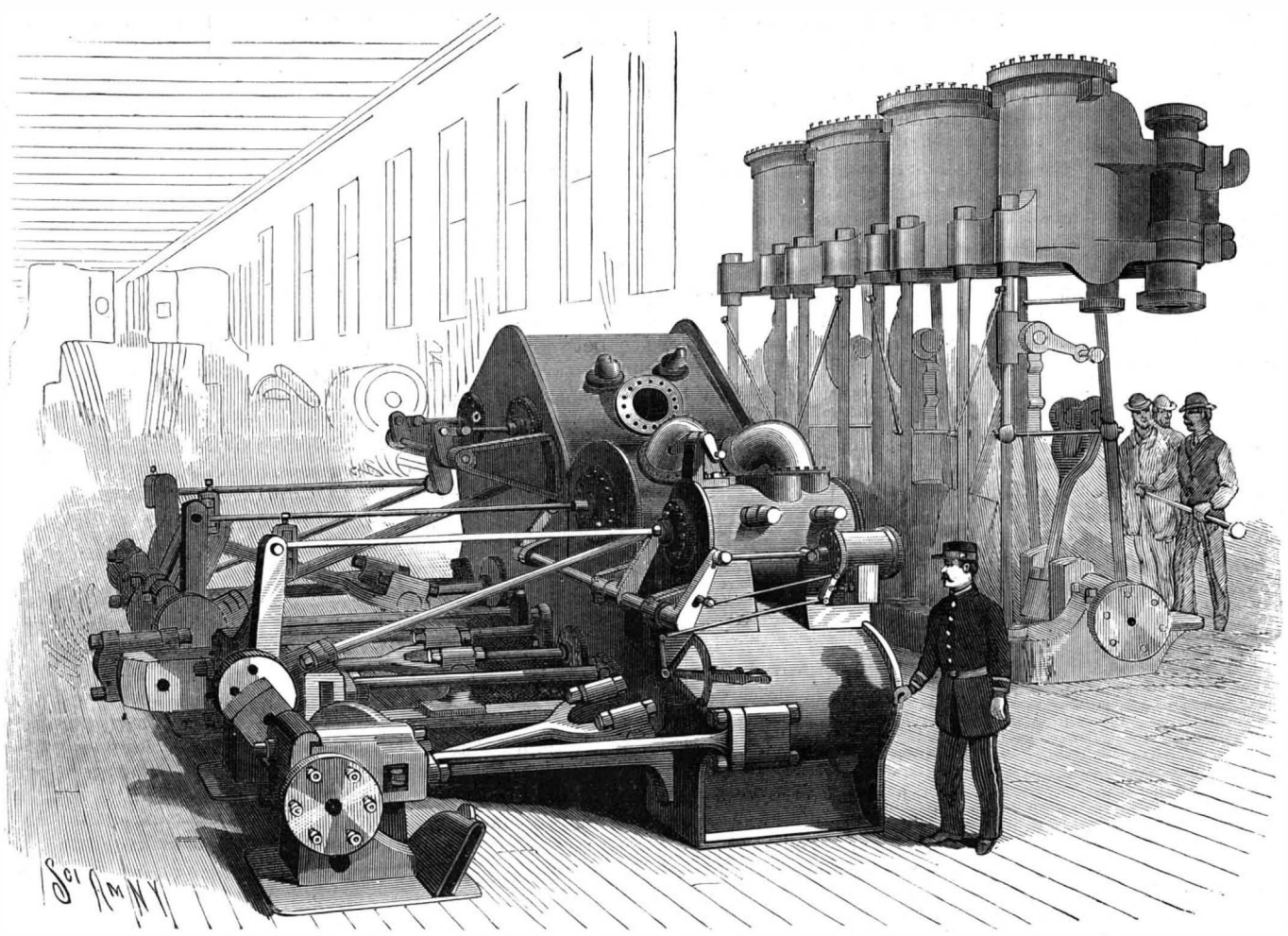
THE ENGINES OF THE VESUVIUS AND YORKTOWN.

The launch of the two new cruisers was illustrated in our last issue. The vessels, as far as regards their hulls, presented many features of interest. The ships, after the launch, were taken to the docks, and are now awaiting the reception of their boilers, machinery, and general equipment. In the present issue we give a view of one of the engines, as nearly completed, of each cruiser.

The Vesuvius, the pneumatic dynamite gunboat, is to have two compound engines, driving twin screws, each carried by an 8 inch shaft. The engines are of the vertical type, with a framework of round bars, rendered familiar by its extensive adoption on the Thorneycroft torpedo boats. It is peculiar in the system of its compounding, possessing four cylinders, arranged for triple expansion. The diameters of the cylinders, beginning with the high pressure one, are 21½ in., 31 in., 34 in., 34 in., giving as relative piston areas 462$\frac{25}{100}$ high pressure, 961 intermediate pressure, and 2,312 low pressure. The piston stroke is 20 inches for each cylinder. This type of engine occupies very little space laterally, which in so narrow a vessel as the Vesuvius is of paramount importance. The cranks are equally distributed, making angles of 90° with each other. The shafts are hollow and made of Whitworth fluid-compressed steel. They were imported from England.

The engines, by contract, are to indicate 3,500 horse power. Should this amount be exceeded on trial, the builders are to receive a premium for each horse power above it. It is believed that 4,000 horse power will be attained.

The engines of the Yorktown are also triple expansion, but have the regular three cylinders. They are to drive twin screws. Their diameters are 22 in., 31 in., 50 in., giving relative piston areas of 484 high pressure, 961 intermediate pressure, and 2,500 low pressure. The piston stroke is 30 in. for each, and the three cranks are equally distributed as regards their angular position. In placing these engines in the hull, one is to be forward of the other, to save filling up the hold. The indicated horse power, according to the contract, is to be 3,000, a premium being offered for an excess, as in the case of the Vesuvius. The shafts are of the same style and material as those of the Vesuvius, but are only eight inches in diameter.



THE ENGINES OF THE VESUVIUS AND YORKTOWN.

The engines of both vessels are fitted with Marshall valve gear. With a single hand an engine can be reversed, stopped, or started. The boilers are of steel, of the cylindrical locomotive type. The furnaces are cylindrical and corrugated. The pressure carried is to be 160 lb., and four boilers are provided for each ship.

The performances under trial of these engines will be watched for with much interest, as there is every reason to believe that they will maintain the high reputation of their builders, Wm. Cramp & Sons.

Compressed Oil Gas.

At a recent meeting of the Institution of Civil Engineers a paper was read on "Compressed Oil Gas and its Applications," by Mr. Arthur Ayres, M. Inst. C. E.

In considering this system of illumination, its applicability to buoys, isolated beacons, lighthouses, and railway carriages, etc., the author treated it under the primary heads of mode of manufacture, illuminating properties, cost, storage, and transit, and in doing so he referred to the early history of oil gas, and the patents taken out from time to time in connection with the system. It was stated that in 1825 Faraday contributed a paper to the Royal Society "On New Compounds of Carbon and Hydrogen, and on Certain Other Products obtained during the Decomposition of Oil by Heat." That communication, however, dealt with the chemistry of oil gas. It was mentioned in that paper that 1,000 cubic feet of good gas yielded nearly one gallon of hydrocarbon.

The gas from which the hydrocarbon was obtained was manufactured by the Portable Gas Company, and was compressed to 30 atmospheres. It was drawn from a gas holder, and passed over water into a large and strong receiver, and from it into portable vessels, the principal condensation taking place in the receiver. The oil gas manufactured by the Portable Gas Company was not distilled from shale oil or petroleum, but from other oils and fatty substances, mineral or vegetable. Between the years 1792 and 1883, numerous ingenious patents were taken out for manufacturing and compressing oil gas for lighting and heating purposes. Oil or hydrocarbon gas was the product of heavy petroleum or shale oil once distilled. It had a specific gravity of about 0·840, and flashed at about 220° Fah. In detailing the process of the manufacture of oil gas, the author described the works erected at the South Foreland by Pintsch's Patent Lighting Company (Limited).

The illuminating intensity of oil gas might be taken at from 40 to 50 candles when burned in a London standard Argand burner, with a consumption of 5 cubic feet per hour, under a pressure of 0·5 in. of water. The price varied from about 5s. 6d. to 16s. per 1,000 cubic feet, being directly influenced by the quantity of gas produced, the management of the retorts, and the price of oil, fuel, and wages. Until the adoption of oil gas for their illumination, buoys and isolated beacons were only useful for the purposes of navigation by day, but they were now equally so by night (in clear weather), enabling vessels to navigate with safety intricate channels, which hitherto could not have been attempted except at considerable risk.

Gas buoys, as at present used by the Honorable Corporation of Trinity House, were constructed of best mild steel. They were spherical, 9 feet in diameter, and surmounted by a light wrought iron superstructure, carrying a lantern inclosing the illuminating apparatus. The total weight of one of these buoys complete was about 80 cwt., the weight of the buoy being 78¾ cwt., and that of the illuminating apparatus 1¼ cwt. The buoys were usually charged to a pressure of 5 or 6 atmospheres, or from 75 pounds to 90 pounds pressure per square inch. The gas was contained in the spherical portion of the buoy, the capacity of which was about 382 cubic feet, and was consumed at the rate of 0·75 cubic foot per hour, burning night and day continuously.

When fully charged to 5 atmospheres, and burning at the above rate of consumption, the light would be maintained for 106 nights and days. The intensity of the light was from 17 to 20 candles through the lens. The estimated cost of a first-class gas buoy, including the lantern and illuminating apparatus, also royalty, was about 420*l*. In a new form of gas buoy, constructed wholly of mild steel, it was intended to carry the gas in the lower portion of the buoy. The capacity for storage of gas would be 383 cubic feet, which, at a pressure of 5 atmospheres, would sustain the light (consuming 0·75 cubic foot per hour) for 106 nights and days. The advantages of this form of buoy were improved stability and its applicability to the recently adopted uniform system of buoyage. The estimated weight of this buoy was about 6 tons, without moorings.

In 1885 the Canadian government adopted a combination of the bell and gas buoy for service in the Gulf of St. Lawrence, the bell weighing 3 cwt., giving the usual warning by day and night, supplemented by the light. The gas was stored in a welded cylinder (independent of the buoy proper) having a capacity of 339 cubic feet. The cylinder, when charged to 6 atmospheres, was capable of maintaining the light for 113 nights and days. The weight of the buoy complete was 9½ tons. In 1881 a beacon lighted automatically by compressed oil gas on Pintsch's system was adopted by the Clyde Trust Commissioners, who had recently erected another on the Gantock Rock, off Dunoon, on the Argyleshire coast, and who were extending this system of illumination at Cardross and Dumbuck lighthouses, Donald's Quay, Rashilee, and Dalmuir light towers.

In December, 1885, two iron lighthouses, similar in construction, were erected by the Trinity House, one at Stoneness, opposite Greenhithe, and the other at Broadness, on the Thames Estuary. At Stoneness Lindberg's system had been adopted, the burner for producing the light being that of Lyth, of Stockholm. The light burned day and night at full power, showing a white light with short occultation at periods of about five seconds. A description of this system was given. The first cost of Stoneness Lighthouse had been 630*l*., and the cost of its annual maintenance was 88*l*. Broadness light was produced by the combustion of compressed oil gas. The intensity of the flashes at Stoneness was about 60 candles, and at Broadness about 500 candles.

The first cost of Broadness Lighthouse had been 1,026*l*., and the cost of its annual maintenance was 128*l*. Both Broadness and Stoneness lighthouses were under the charge of a boatman, who visited them at least twice a week, when he adjusted and cleaned the apparatus. These systems being comparatively new, no reliable comparison had yet been made as to their relative efficiency. An important installation of an oil gas apparatus for lighting and fog signaling had recently been made by the Commissioners of Northern Lighthouses at Ailsa Craig, on the Firth of Clyde (Min. Proc. Inst. C. E., vol. lxxxix., page 297), the first cost of which had been 24,000*l*., while the cost of its annual maintenance was 725*l*. There were now 214 buoys, lightships, beacons, and other lights in use in various countries on Pintsch's system.

The author next dealt with the application of compressed oil gas to lighting of railway carriages. It was probably first tried in the year 1871 with satisfactory results in Germany, on the Lower Silesian Railway, and in England, in 1878, on the St. John's Wood trains of the Metropolitan Railway, with equally satisfactory results. The Great Eastern Railway Company was the next to adopt it, the Metropolitan Railway Company definitely adopted it for the whole of its rolling stock a few weeks later, and other companies quickly followed suit. The systems chosen were those of Messrs. Pintsch and Messrs. Pope & Sons, which differed but little from each other. Some trials were also made of Messrs. Bower's system on the Great Northern Railway. The gas holder was attached either to the roofs or to the under-framing of the carriages, and was charged to a pressure of from 6 to 8 atmospheres. The gas was conveyed to the roof lamps by pipes from the gas holders, passing through a contrivance for regulating the pressure at the burners, one such regulator being attached to each carriage. There were now 23,499 carriages so illuminated on Pintsch's system, and 2,791 on Pope's system. Taking the double journey between Euston and Aberdeen, the cost of compressed oil gas was 0·0404d. per lamp per hour, and for the ordinary oil system 0·385d. per lamp per hour, showing a greater cost of the ordinary oil system of 0·3446d. per lamp per hour, or 8½ times more than oil gas.

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ENGINEERING INVENTION.

A fish plate has been patented by Mr. Camille Licardie, of Clermont, De San Marcos, Guatemala. It is designed for use with railway rails, to be fastened longitudinally by the fish plates, each of which has on each end a downwardly projecting tooth fitting loosely into a corresponding aperture in the base of the rail.

AGRICULTURAL INVENTIONS.

A horse hay rake has been patented by Mr. Julius H. Bally, of Paradise Hill, Ohio. It is designed to gather the hay and discharge it in a line parallel with the line of travel of the machine, and at right angles to its axle, the invention covering various novel features of combination and arrangement of parts.

A planter has been patented by Mr. Alfred W. Black, of Traverse City, Mich. It is for use with potatoes or other sets, and is made with two jaws to be forced in the ground a regulated depth, the jaws being separated at the bottom to allow the contents of the planter to drop therefrom, the device also serving to gauge the distance for the next hill.

MISCELLANEOUS INVENTIONS.

A whip has been patented by Mr. Patrick S. Harrington, of Cheyenne, Wyoming Ter. This invention covers an improvement in the process of manufacture, consisting in wrapping an elastic stock with raw hide, together with a method of treating the hide before applying to the stock.

A wagon brake has been patented by Mr. Fred Rice, of Shopiere, Wis. It is constructed and arranged to be operated by the neck yoke, and so that the brake blocks will not interfere with the free backing of the wagon, the invention covering novel features of construction, combination, and arrangement of parts.

A clasp has been patented by Mr. James H. Conaty, of West Haven, Conn. The "cast off" finger or tongue of the clasp is formed from a part of the body of one of the jaws or members of the clasp, whereby the clasp can be produced with less labor than those of the usual construction.

A glass cutting table has been patented by Mr. Alonzo Hughes, of Orlando, Fla. One end of the table is provided with feeding and gauging devices, and the other end has a plain surface and straight-edged end upon which the glass may be broken, with other novel features, for facilitating the work of the cutter.

A dumping grate has been patented by Messrs. Peter Rensland and Charles Fisher, of Port Jervis, N. Y. The construction is such that by rotating a longitudinal shaft the grates may be turned at any angle to the frame, or they may be turned completely over and the faces used alternately, while the parts are interchangeable.

A fruit jar fastening has been patented by Mr. William Brace, of Washingtonville, Ohio. This invention covers a peculiar construction of cover and fastening bail, the bail being swung over the cover in locking the latter down by a roller riding in a groove, and forcing the cover down with an elastic pressure until the locking position has been attained.

Dental foil forms the subject of a patent issued to Mr. Thomas J. Henry, of New York City. This invention covers a sheet of dental foil having depressions causing breaks or punctures in the continuity of its fiber, and not mere superficial indentations for purposes of ornamentation, the punctures forming an important element in softening the foil.

A shoe heel has been patented by Mr. Antoninus Farina, of New York City. It is designed to have the appearance of being made, except for the heel tap, of a single thickness of leather, while wearing as the ordinary built-up leather heel, the construction being such that the tap may be readily removed when worn and another substituted without removing the heel from the shoe.

A spoke drawer has been patented by Mr. John M. Germann, of New York City. It has a main bar adapted to bear on and grip one edge or face of a spoke, with a stirrup for gripping the opposite edge, and a thrust bar adapted to bear on the wheel hub, making a simple and inexpensive device for quickly and easily drawing the spokes from light or heavy wheels.

A street and station indicator for cars and stages has been patented by Mary J. Watson, of Sacramento, Cal. It consists in a series of cards arranged to turn on a common pivotal wire, each card having two sets of names oppositely arranged with respect to each other near opposite edges of the card, the cards being of suitable size to admit of being inverted.

A wagon axle has been patented by Mr. Nathan W. Blevens, of Aurora, Tex. The invention covers an axle combined with a spindle whose shank has a threaded inner end, with nuts turned thereon on opposite sides of the inner seat, by which the spindle may be adjusted to and held in any desired position, and the wagon set to standard or narrow gauge as desired.

An oven has been patented by Mr. Levi Coke, of Elmira, N. Y. It is for bakers' use, and has three lower compartments, an upper compartment, a central flue in the top, and other novel features, affording means for uniform heating and keeping the shelves free from dust and smut, and wherein the shelves are arranged handily, while the oven will be free from gas and smoke.

An apparatus for coloring or bleaching cured or dried tobacco has been patented by Messrs. James K. Hardwicke and James J. Redmon, of Marshall, N. C. It consists of a structure with transparent or translucent outer wall, an inner light-reflecting wall, with plant or leaf supports or racks, whereby the tobacco will receive both direct and reflected light to give it a uniform color.

A nut lock has been patented by Mr. Marshman H. Phillips, of Verschoyle, Ontario, Canada. Its body is substantially rectangular in form, and constructed of malleable iron, being designed as a simple and cheap construction of nut lock for railroad rails, to effectually secure the heads or nuts of the bolts securing the fish plate, and forming a device which may be conveniently removed when a rail is to be replaced.

A pneumatic annunciator has been patented by Mr. William R. Ostrander, of Brooklyn, N. Y. It has an alarm train provided with a toothed wheel, a toothed bar arranged to engage with the toothed wheel and formed with an elongated slot through which is passed a supporting pin, an operating bar, and connections, the parts being so arranged that the resetting of the drops will rewind the alarm attachment.

An apparatus for steaming cloth and other fabrics has been patented by Mr. Voorhees T. Van Fleet, of Somerville, N. J. It has perforated steaming beams constructed with a series of longitudinal compartments arranged one above the other and provided with steam inlets and outlets at different heights, with other novel features, the apparatus being adapted to readily work on different kinds and thicknesses of goods.

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MAY NUMBER.—(No. 31.)

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
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Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) E. K. asks: 1. Is there anything I can use besides borax for soldering gold jewelry, for when you heat that it pushes the work away, or could I put anything in it to keep it from moving the work away? I use one kind of gum, but it is of not much use. Is there a substance which will stick the work to sheet iron, so when it is heated it will become hard, and thereby hold the work, so the borax in evaporating its water will not move the work away when soldering it? A. Use borax glass finely powdered and mixed with water, to form a thin cream. Borax glass is prepared by fusing borax. 2. What can I put in an alloy of gold and copper so as to make it hard? A. Try a small percentage of tin.

(2) M. S. asks: 1. Is it absolutely necessary that the winding of the coil on armature of simple electric motor should be in even and parallel lines? A. It will not be fatal to the working of the machine if the coils are not absolutely perfect. High efficiency in the working of the motor can only be secured by careful attention to all details. The coils should be made compact, and the winding should be even and parallel. 2. Could the motor be used as a dynamo by making changes, and what change would be necessary? A. To make a dynamo upon this principle, it is only necessary to use finer wire on the armature, and make the field magnet of cast iron. 3. Would it then furnish electromotive force sufficient to run a 16 candle power lamp? A. We think it is hardly sufficient to run such a lamp.

(3) L. R. M. asks: 1. Can the simple electric motor described in the above paper for March 17, 1888, be run by Grenet storage batteries, or if not, how can it be made to, also by what other ones besides the one mentioned in the article, can it be run? A. The motor referred to can be operated by any battery or arrangement of batteries that will yield a current of 12 volts and 6 amperes. 2. Also can the said motor be made into a dynamo, and if so, how? Also how many one candle power lamps would it supply, and how much power would it require? A. See reply to M. S.

(4) G. L. D. asks: Will you kindly inform me through your paper if simple electric motor, if connected with an Edison dynamo, will run a 9 inch swing iron lathe? If not, would it increase the power by doubling the width of armature, also that of magnet, and winding it the same with No. 16 A. W. G. cotton-covered magnet wire? A. The motor, if properly wound, is of sufficient size to run such a lathe, doing light work, but the armature should be wound with finer wire.

(5) J. A. V. writes: 1. I have just completed an induction coil having about 2,400 feet of wire, No. 36. How many quart bichromate potash cells can be used? A. If your secondary wire is properly insulated, you can probably use about 6 cells of plunging bichromate battery, with zinc and carbon plates 3x6 inches. 2. The coil is constructed with a draw tube. Must the primary coil fit exactly in the draw tube or not? A. The distance between the primary coil and the core and the primary coil and the secondary wire should be only enough to admit of proper insulation. 3. Is there any difference in currents, if there are four layers of wire on primary coil? A. There will probably be no advantage in using four layers of wire.

(6) G. D. writes: I have tried the magnetizing influence on my watch, and can say that my watch will not run, and am at sea to know what to do in order to demagnetize it. Would you please be so kind as to tell me what to do? A. Place your watch in a coil of 2 or 3 ohms resistance, connect the coil with a plunging battery, reverse the current rapidly as the battery is plunged, and also while the elements are being withdrawn from the solution. Test your watch by bringing it near a compass needle. If you find that any part of the watch repels the compass needle, you will know that magnetism still remains in the watch, and you will be obliged to repeat the operation just described. If, after treating it several times in this manner, you find that it still retains magnetism, you can remove the last trace by the judicious application of a permanent magnet to the edges of the watch.

(7) G. E. S.—The only successful way of burning petroleum under boiler is the jet burner, using the steam as a blow pipe. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 455, "Petroleum as Fuel;" No. 592, "Petroleum Burners;" No. 623, "Burners for Boilers;" No. 615, "Petroleum Fuel;" No. 618, "Lenoir's Petroleum Engine. "There are several patents on devices for burning petroleum. You can turn a screw easier with a long screw driver because you have a better hold or grip. Salt liquefies ice by its chemical affinity for water, forming a liquid (salt water) that is fluid at a very low temperature.

(8) J. W. K., Jr.—Red shortness in iron is caused by excess of sulphur, amounting probably to four-tenths to six-tenths of 1 per cent. This causes the iron to be brittle at a red heat. Cold shortness or brittleness, when cold, is caused by phosphorus and silicon, the proportions varying from one to two tenths of 1 per cent. You will find description of crucible steel plant

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in SCIENTIFIC AMERICAN SUPPLEMENT, No. 464, crucible, open hearth, and Bessemer in 505, open hearth illustrated in 615, Clapp-Griffith in 490, description of the steel plants in United States in 535, all of which we recommend for your perusal. To soften your brushes, put the shellac brush in 95 per cent alcohol, put the paint brush in turpentine to soak, or in strong solution of soda in water.

(9) N. N. W.—It is said silver prints will not curl at the edges if they are finally washed in the following solution:

Water	1 part.
Alcohol	4 "
Glycerine	3 "

To ventilate a small dark-room, connect the dark room light by a good sized pipe to the outer air, or to a chimney having a free draught. Then provide openings in the partition at the bottom near the floor, protected by Λ-shaped wings, which will keep out the light, but let in air. The larger the openings in extent are, at the bottom, the better will be the circulation. The general principle to be borne in mind, is to let plenty of air in at the bottom, with an abundant free exit for the heated, bad air at the top, protected from light.

(10) G. S. A. asks: 1. How can I make a stain for walking sticks, different shades? A. See the formulas given for stains of all colors in "Moore's Universal Assistant and Complete Mechanic," which we can send you post paid for $2.00. 2. A method for polishing alligator teeth. A. Rub them first with fine glass paper and then with a piece of wet linen cloth dipped in powdered pumice stone. This will give a fine surface, and the final polish may be produced by washed chalk or fine whiting, applied by a piece of cloth wetted in soapsuds. 3. A method for bleaching them perfectly white after they have turned yellow. A. Use peroxide of hydrogen. See article on its application, in SCIENTIFIC AMERICAN SUPPLEMENT, No. 339.

(11) J. H. F. asks how to make a toning bath for rich dark tones. A. If freshly sensitized paper is used, fume it for 25 minutes over ammonia. After printing, and prior to toning, wash the prints in three changes of warm water, letting the last water contain a minute portion of carbonate of soda. Pour into the toning tray the amount of gold you intend using, and neutralize it drop by drop with a saturated solution of carbonate of soda until it turns red litmus paper blue. Then add the amount of warm water necessary to complete the bath, and dissolve in the tray 100 grains of common salt. Let the bath stand for ten minutes. The longer you tone, the more purple will be the prints. They turn red at first, and then change to the desired color. If the bath is kept warm, the toning will proceed rapidly. Use an abundance of the gold solution.

(12) J. M. C. writes: While watching a pair of rough iron bevel wheels running, I saw sparks flying from the teeth. Supposing that they were caused by friction through not being properly lubricated, I examined them, found no sign of cutting or undue friction, and concluded that the sparks were from electricity, and not from heat. At the same time, in another place, one of our engines was so charged that it ran an electric bell with a single wire. A. We differ with you in regard to the cause of the sparks. The gears are metallic and are conductors of electricity. The conditions of metallic contact as with gearing do not admit of an atmospheric escape of electric sparks; they go the other way. The sparks, no doubt, are derived from the heat of friction developed in the minute particles of iron dust abraded from the surface of the teeth. The teeth of the gears would not show much increase in temperature, but any minute particles driven off by friction would take fire in the same manner as in the cold sawing of iron. The slipping of the driving wheels of locomotives strikes fire in the dust of abrasion. Your engine was charged with electricity from the belt, which is a very common phenomenon. By placing an insulated row of metallic points near the inside of the belt, a few feet from the large pulley, you may make a very interesting electric display by insulating a person on a rubber mat, or a platform set on glass bottles, and in that way, by taking hold of the end of the metallic receiver under the belt, make the person a Leyden jar, capable of giving quite a shock by touching another person or a number of persons holding each other's hands.

(13) D. E. W. asks: 1. Can iron which has been made into stove funnels, but which is nearly new, be used for the field magnet of the motor? A. It is better to use new, clean iron, but without doubt your iron will answer if well scraped and cleaned. 2. In a bichromate of potash battery, would the battery work as well if the zincs were amalgamated? A. The zincs must be amalgamated. 3. Is there any limit as to the numbers of messages which can be sent on the same line at the same instant? A. The practical limit is four.

(14) O. M. M.—There are tools sold by the dealers in emery wheels that break up the surface or true it, when glossy or out of true. Hydrochloric or nitric acid will clean a metalized wheel. Swab the surface with the acid, let it lie 15 to 20 seconds, and quickly wash the surface clean with water, and dry.

(15) F. M.—We have no knowledge of the welding compound you mention, nor have we any reliable receipts for welding cast iron to cast iron. Such work is impracticable. Steel, it is said (probably machinery steel), has been welded to cast iron by the use of borax and sal ammoniac. Cast iron that has been treated to make malleable iron can be welded to steel with borax. It is also said that two pieces of cast iron may be sweated together with borax. This process is liable to melt one or both pieces.

(16) F. B. M. asks what to use to prevent brass from tarnishing after it has been polished, as in the brass standards and lecterns of a church; the manufacturers of them put something on that kept them from becoming dull for a long while. A. Use a solution of clear shellac in 95 per cent alcohol. A half ounce shellac to one pint alcohol, cork tight in a clear bottle. Shake and set it in a warm place for a few days. Decant the clear solution at the top for your lacquer. Use a camel's hair flat brush. Heat the brass work to nearly the temperature of boiling water, in an oven or otherwise, and varnish quickly, going only once over the work; put the work back in the oven for a few minutes to melt and make the lacquer clear.

(17) J. M. W. asks what kind of paint is the best, most durable, and smoothest to use on the bottom of small sail boats, yachts, on fresh water lakes. Used black paint composed of lamp black and linseed oil, last year, and bottom became very rough and coated with a vegetable growth. A. Use a little plumbago (pulverized) in the black paint, when dry, rub down smooth with dry plumbago on a woolen rag. Repeat the rubbing at times during the season, and if the paint gets worn off or thin, rub with plumbago and linseed oil. A little coach varnish mixed with any painter's color makes a good finish for upper work.

(18) H. N. L. asks: Will a balance wheel which is out of balance shake or tremble, if run on an upright shaft? And if so, why? A. Yes; it will shake, and if run fast enough it will shake the building. The centrifugal force of the heavy side will exert its full value upon its confining center or shaft, which will spring, and if in unison with the surrounding framework holding the journals, may set a whole building to vibrating.

(19) S. E. M. asks: What are the wages paid to good draughtsman, and what is the best way to learn draughting? A. There is no regulated scale of wages of a draughtsman. A boy can drive a rule and pen, but it takes brains to make a good draughtsman. This commodity may be worth from $500 to $5,000 per annum. If you have ideas and have the energy, you will succeed accordingly. To start, get the series of SCIENTIFIC AMERICAN SUPPLEMENT, on mechanical drawing ($2.50), with the instruments there listed, and get to work. After you have assured yourself that you can handle the pencil and pen, offer your services as assistant in some engineering establishment.

(20) T. H. asks a formula for the strength of threaded couplings on iron pipe, in supporting weight hung, as on a rope, safe load, also breaking or stripping weight. A. The ordinary make of couplings on iron pipe cannot be trusted for more than one-half the value of the area of pipe section, on the basis of 30,000 pounds per square inch, divided by 4 for safe load, or divide the area of section in square inches by 2, and multiply by 30,000 for breaking load. Divide the breaking load by 4 for safe load for short usage. If for a pump rod, divide by 6.

(21) W. B. asks: What will remove shellac and varnish from Spanish cedar without cracking or marring it? A. If it is a varnish in which turpentine was the solvent, use a mixture of alcohol and turpentine. If it is shellac varnish, it can be removed by a simple application of alcohol.

(22) P. H. asks: 1. How is royal copper, or sometimes called cypress copper, made, such as seen on lamp bodies, imported from France? A. For the red color on copper. Boil the articles in tartaric acid and water 15 minutes, rinse in cold water and dry. 2. Which is the best way to purify mercury for surgical purposes and for barometers? A. Mercury is purified by distillation, or by prolonged treatment with dilute nitric or sulphuric acids, followed by washing and heating to over 212° F. Distillation is the best method.

(23) W. W. D. asks: 1. Can the small electric motor described in SCIENTIFIC AMERICAN, of March 17, 1888, be driven by a current generated by an earth battery? A. We think it would be impracticable, as it would require a large number of plates of large size. 2. What number of plates will be required, what the size of each plate and how should they be arranged in the ground so as to attain the greatest electromotive force? A. We have no data which will enable us to estimate the number of plates required, but it would probably run up into the hundreds.

(24) E. M. writes: I have secondary coil of an induction coil 6¾ inches long, 2⅛ inches in diameter, hole through center 1⅛ inches in diameter, wound with 24 layers of No. 36 silk covered copper wire. What size of wire and how large core of primary coil for the above should be used to secure best results? A. The hole through the center of your coil is rather large—an inch, or 1⅛ inches would have been ample. Make the core of your coil of a bundle of No. 20 soft iron wire. The primary coil should consist of 2 layers of No. 16 magnet wire.

(25) S. D. B. writes: 1. I wish to make motor one-half size of one you describe. Please inform me the size wire I must use, both iron for armature ring and insulated. A. Use No 20 wire. 2. Will it be advisable to use it for watch makers' lathes, and is there power enough for Moseley's No. 2? A. It will readily run a watchmaker's lathe.

(26) J. P. M. asks how to cover a wooden wheel with emery so that it will stick. A. Use the best and strongest brown glue, well heated and quite thick. Warm the wood, and apply the glue hot with a brush, following behind the brush with a sprinkling pan of emery, or roll the wheel in the emery as fast as the glue is applied. When dry, the excess will readily come off by scraping.

(27) D. W. C. asks: What is the metal molybdenum used for? A. The principal use of molybdenum is for the manufacture of molybdate of ammonia, used in phosphoric acid determinations, and of similar salts.

TO INVENTORS.

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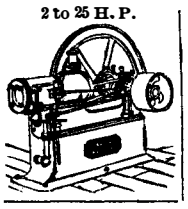

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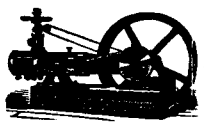

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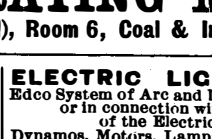

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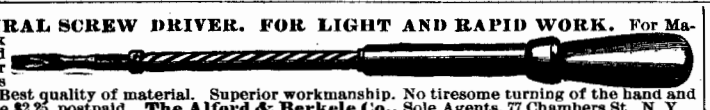

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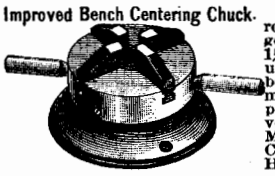

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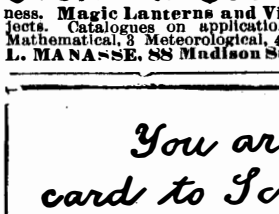

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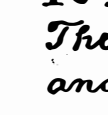

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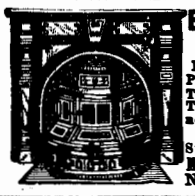

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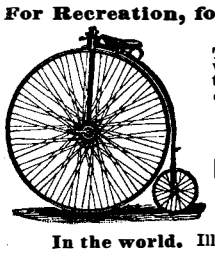

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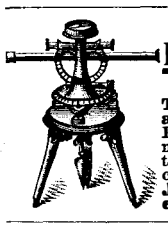

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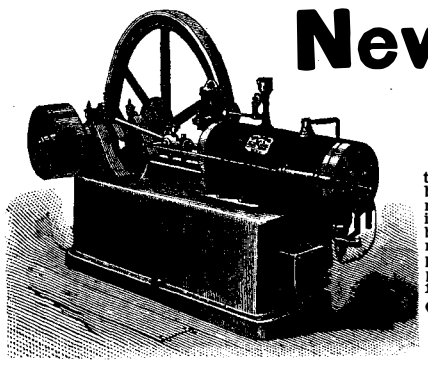

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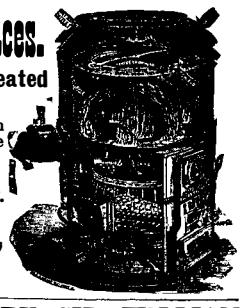

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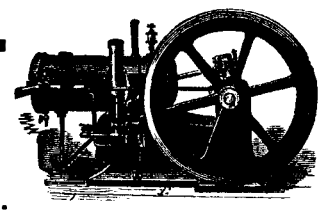

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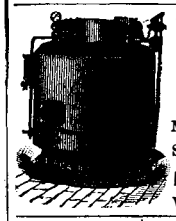

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